

# Clinical practice guidelines for physical therapy in patients with whiplash-associated disorders

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## Introduction

These guidelines describe the diagnostic and therapeutic processes involved in the physical therapy of patients suffering the harmful consequences of whiplash injury to the neck. Principle of these guidelines is that whiplash trauma involves minor soft tissue damage that may lead to a number of complaints, which are referred to as 'whiplash-associated disorders'. These complaints can be described in terms of impairments (such as pain or a decreased range of motion of the neck), disabilities (for example, in performing normal daily activities) and problems with social participation (for example, problems in returning to work or reduced social contact). In these guidelines, a bio-psychosocial approach to the consequences of whiplash trauma

has been adopted. The pathophysiology of whiplash injury and the choices made in arriving at guideline recommendations are described in the 'Review of the evidence', the second part of these guidelines. The key concepts used are explained in an appended glossary.

**A bio-psychosocial approach has been adopted as the starting point for the physical therapy of patients suffering the consequences of whiplash injury.**

## Definition of whiplash

Whiplash is an acceleration-deceleration mechanism of energy transfer to the neck. It may result from rear-impact or side-impact collisions in a motor vehicle, and can also occur during diving, for example. The

Table 1. Classification of the grades of severity of whiplash-associated disorders.\*

Grade	Description
0	no complaints, no physical signs
1	pain, stiffness and tenderness in the neck, but no physical signs
2	neck complaints and other musculoskeletal complaints (e.g., a decreased range of motion and tender spots)
3	neck complaints and neurological signs (e.g., decreased or absent deep tendon reflexes, weakness, and sensory deficits)
4	neck complaints and fractures or dislocations

\* Symptoms and disorders that can be manifested in all grades of severity include deafness, dizziness, tinnitus, headache, memory loss, dysphagia and temporomandibular pain.

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impact may result in injury to bony or soft tissue (i.e., whiplash injury), which in turn may lead to a variety of clinical manifestations. Frequently occurring symptoms are neck pain, decreased mobility of the cervical spine, headache, and dizziness. The clinical symptoms, which are known as whiplash-associated disorders, can be classified into five grades of severity (Table 1). These guidelines concentrate on patients with grade-1 and 2 whiplash-associated disorders. Patients with neurological signs, fractures or dislocations are not covered by these.

In addition, the time that has passed since the injury can be divided into six phases: less than four days; four days to three weeks; three to six weeks; six weeks to three months; three months to six months, and more than six months. In these guidelines, the time that has passed since the injury is related to the consequences of whiplash.

### Epidemiology

Epidemiological data on the incidence of whiplash are mainly derived from insurance claim numbers. Therefore, the reported annual incidence of whiplash varies widely between countries and continents: figures vary from 16 per 100,000 inhabitants each year in New Zealand to 70 per 100,000 inhabitants each year in Quebec, Canada. In the Netherlands, the number of new patients who have experienced whiplash is estimated to be 94–188 per 100,000 inhabitants each year. These figures are much higher than international estimates because they are derived from accident statistics. There are no Dutch data on the prevalence of specific symptoms after whiplash.

### Prognosis

There is no consensus in the literature on the prognosis of the consequences of whiplash. The prevalence of long-term complaints (i.e., from six months to two years) varies from 19–60%. A Canadian research group, the Quebec Task Force on whiplash-associated disorders (QTF-WAD), reported that the prognosis is favorable: around 85% of patients return to work within six months after the whiplash injury. Recently, this conclusion has been criticized because the severity and duration of the complaints may have been underestimated.

### Normal and delayed recovery

A distinction is made between patients who undergo normal recovery and those who undergo delayed recovery after whiplash injury. Normal recovery refers to the 'average' or 'expected' course of recovery from the consequences of whiplash. Normally, over time the patient's functions improve, the patient's levels of activity and participation increase, and the patient's pain level declines. Moreover, there is some interrelationship between impairments, disabilities and participation problems. When recovery is delayed, it may be that the patient's functions do not improve or the patient's levels of activity and participation do not increase or the patient's pain level does not decline with time. Moreover, the interrelationship between impairments, disabilities and participation problems is less obvious. In the working group's view, recovery can be said to be delayed if a patient suffering the consequences of whiplash shows no progress in terms of levels of activity and participation within four weeks.

Table 2. Prognostic factors associated with delayed recovery after whiplash.

#### Whiplash-related factors:

- decreased mobility of the neck immediately after injury;
- pre-existing head trauma;
- female gender;
- volder age.

#### Factors related to chronic pain:

- coping strategy;\*
- psychosocial factors (e.g., passive coping, fear or job dissatisfaction).

\* can be influenced by physical therapy

With normal recovery, activity and participation levels increase over time. This is not the case with delayed recovery.

#### Prognostic factors

A number of factors are associated with delayed recovery after whiplash injury (Table 2). The first four factors listed in the table are related to whiplash; the last two factors concern chronic pain in general.

#### Coping strategy

During recovery, patients may cope with their complaints either adequately or inadequately. Coping is connected with the extent to which a person is able to adjust his\* load (i.e., what he wishes to do) to his load-bearing capacity (i.e., what he can do). Load-bearing capacity depends on the patient and is, among other things, determined by the time that has passed since the injury, which is related to the physiological recovery phase, and by psychosocial factors.

People who continue to perform their activities or work in appropriate ways have adequate coping strategies. When complaints persist, the adoption of strategies such as seeking distraction from pain or aiming for an active life style indicate adequate coping. People who, on the other hand, restrict their movements because of their complaints, who persist in avoiding certain activities, or who rest a lot to relieve pain have inadequate coping strategies.

The significance attached to pain and the level of control experienced are important in respect to coping. The significance a patient attaches to his complaint very much determines the complaint's emotional impact, which can vary from being "not threatening at all" to being "highly threatening". The more a patient feels threatened by his complaints, the higher the likelihood that he will cope inadequately. Patients experience a high level of control when they understand the health problem and have the confidence to be able to influence their complaints themselves. In addition, social factors, such as the patient's interaction with his environment, can influence coping strategy.

#### Role of the physical therapist

The general objectives of physical therapy are to enable the patient suffering the consequences of whiplash to return to normal, or desired, levels of activity and participation, and to prevent the development of chronic complaints.

In the first three weeks after whiplash, the physical therapist should observe the patient and should take actions that encourage recovery from the injury to follow a natural course. From three to six weeks after whiplash, the physical therapist should, if necessary, try to modify the patient's coping strategy using behavior-oriented principles that focus on the patient's functioning. Here, the physical therapist's attitude can have an influence on recovery. If too much attention is paid to pain and not enough to encouraging activity, recovery can be negatively affected.

The objectives of physical therapy are to enable the patient to return to normal, or desired, levels of activity and participation, and to prevent the development of chronic complaints.

#### Interdisciplinary cooperation

In the Netherlands, there are no guidelines for primary care physicians or medical specialists, which describe the treatment of patients suffering the consequences of whiplash. The Dutch Whiplash Association has published an advisory note as a first step in achieving a clear policy on the initial care of patients with whiplash injuries. More details are given in the review of the evidence. To help optimize cooperation and communication between primary care physicians and physical therapists, specially developed guiding principles could be used. These cover indication setting, letters of referral, consultation, contact during treatment, and writing reports.

#### Diagnosis

The objective of the physical therapy diagnostic process is to assess the severity and nature of the health problem affecting the individual patient and the extent to which it can be influenced. The

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

patient's needs are of primary concern. The physical therapist assesses how the condition has progressed and relates this to the time that has passed since the injury. He also assesses the patient's coping strategy and knowledge about his condition.

### Referral

Carrying out treatment in accordance with these guidelines requires referral from a primary care physician or medical specialist. The referral documentation must describe the reasons for referral. If it does not, the physical therapist must contact the referring physician. Referral data should include details of: the whiplash-associated disorder grade of severity; the patient's previous history, including, in particular, information on pre-existent complaints, known deviations from the usual situation, other disorders, and medication use; and relevant psychosocial factors.

### History-taking

During history-taking, the physical therapist should obtain information about the patient's functions and levels of activity and participation, and about factors that either promote or inhibit recovery. The physical therapist should also ask about demands made on the patient by his normal daily activities and by his

working situation to gain an impression of the patient's load in relation to his load-bearing capacity (Table 3).

Assessment tools can be used to evaluate objectively the observations made and the effects of interventions. The working group advises use of the following tools in patients suffering the consequences of whiplash:

- Visual analogue scales – used to map the intensity of the patient's 'most important complaints'. It is recommended that visual analogue scales are used at set time periods;
- Neck disability index – used to map the patient's functioning systematically;
- Daily diary – used to record the patient's activities. For example, in practice, the patient keeps a daily diary for one week that contains details of the activities he undertakes, how often and for how long he undertakes them, and whether these activities result in a decrease, no change or an increase in the level of complaints. Also included are details of any actions taken when the level of complaints increases, such as pain medication use, resting, or seeking distraction.

Table 3. Main points of history-taking in patients suffering the consequences of whiplash.

#### Details of current complaints and patient's needs

##### *Accident-related data:*

- details of the situation before the whiplash, including data on any pre-existing or similar complaints, and on the patient's activities and level of participation;
- accident-specific information.

##### *Patient's progress over time:*

- data on impairments, disabilities and participation problems, including details of their severity and nature;
- data on previous diagnoses, treatment and the results of treatment;
- details of any other earlier information and who provided it.

##### *Coping strategy:*

- What meaning does the patient give to his complaints?
- Does the patient have control over his complaints?

##### *Status praesens:*

- systematically ask about different functions, activities and forms of participation;
- Is the (bio-psychosocial) load in proportion to the patient's load-bearing capacity?
- present treatment, including details of medication use and other treatments;
- assessment of patient's information needs.

## Examination

### *Observation and palpation*

The physical therapist observes and examines the patient's body posture and motion, paying special attention to the spinal column. The main points are to look for the presence of a list and to observe neck muscle tonus.

### *Physical examination*

During physical examination, the physical therapist assesses the patient's functions and activities, preferably by using active methods of examination. At a minimum, the following functions should be examined:

- the functioning of joints in the cervical spinal column and shoulder region (mobility and range of motion should be assessed, and whether symptoms can be provoked);
- muscular function (muscular stability of cervical spinal column);
- balance (by using a tightrope walker's gait or standing on one leg).

Additional examination of the patient's functions and activities may be carried out depending on the patient's needs and whether he has any problems performing normal daily activities.

If the physical therapist suspects neurological damage, he should carry out a neurological examination. This should include tests of sensibility, muscle strength and tendon reflexes in the upper extremities. If a neurological deficit is present, the referring physician should be consulted or the patient should be referred back to him.

### **Analysis**

During analysis, answers must be obtained to the following questions:

- What are the consequences of whiplash, in terms of impairments, disabilities\* and participation problems\*\*?
- Which phase is the patient in (in terms of the time that has elapsed since the injury)?
- Is recovery normal or delayed?

- Is local or systemic load balanced with local or systemic load-bearing capacity?
- At present, which factors inhibit recovery (Table 2)?:
  - Is the patient coping adequately?
  - Are there any other inhibitory factors?
- Can impairments, disabilities, participation problems and factors inhibiting recovery be influenced by physical therapy?

After analysis it should be clear whether physical therapy is indicated and whether it is possible to treat the patient according to the guideline. The physical therapist then formulates a treatment plan together with the patient. If the physical therapist suspects that certain complaints, such as dizziness, or certain factors, such as the patient's coping strategy, can only be influenced to a limited extent by physical therapy, he should contact the referring physician.

*The treatment plan is determined by the patient's load-bearing capacity, the relevant impairments, disabilities and participation problems, and how the patient is recovering from the consequences of whiplash over time.*

### **Treatment plan**

The most important physical therapy interventions for patients suffering the consequences of whiplash are counseling and exercise therapy. Counseling involves providing support, information and advice. The physical therapist teaches the patient how to cope with his complaints independently, how to influence his complaints, and how to act if there is a reversal in or an aggravation of the condition. The effect of other interventions, including massage, traction, mobilization, ultrasound therapy, short wave therapy, laser therapy and electrotherapy, has not been investigated or their efficacy has not been demonstrated in this group of patients. Therefore, use of these interventions is not covered by these guidelines.

The physical therapy of patients whose recovery is normal focuses on disabilities (in, for example,

\* In terms of the ICF (International Classification of Functioning, Disability and Health): Activity limitations.

\*\* In terms of the ICF (International Classification of Functioning, Disability and Health): Participations restrictions

lifting, carrying, or maintaining a sitting position) and the impairments that cause these disabilities (such as, decreased mobility or decreased muscular stability). A central element of treatment in patients with delayed recovery is, if necessary, influencing coping strategy. In addition, treatment also includes physiological training and providing appropriate exercise therapy.

**Treatment goals in each phase**

In phase 1 (up to four days after whiplash), treatment focuses on load reduction. In phase 2 (four days to three weeks), the patient’s functions are improved and the load is gradually increased. This policy is continued into phase 3 (three to six weeks) and phase 4 (six weeks to three months). If recovery is delayed, treatment focuses on factors that maintain the complaints. Central concerns are the patient’s coping strategy and ensuring that the patient’s levels of activity and participation are gradually increased by means of an exercise program (Table 4).

**Therapy**

The therapeutic process is based on the individual treatment plan formulated by the physical therapist together with the patient. It is elaborated in accordance with different phases mentioned above, which start at the time of the accident. These phases have to be seen as a series of gradual divisions in the process. The use of collars, including soft collars, is not recommended. If a patient is wearing a (soft) collar at the time of referral, the physical therapist will arrange for its use to be reduced after consultation with the referring physician.

**Phase 1 (up to four days after the injury)**

In the first three days after the whiplash injury, local reactions to tissue damage occur. The most important symptom is pain. If the pain intensity is high, the possible use of pain medications should be discussed with the primary care physician. Treatment aims to reduce the load on the patient, thereby enabling tissues to recover.

Treatment goals: reduce pain, and increase the patient’s knowledge about and insight into his condition.

Interventions: counseling, including the provision of information and advice.

**Providing information and advice**

The physical therapist should inform the patient about the nature of the injury and its natural course of recovery and give advice on how to reduce the load on the patient. To aid functional recovery, the physical therapist should advise the patient to move in a well-balanced way.

**Phase 2 (four days to three weeks after the injury)**

In this phase, the patient’s functions are improved and the load on the patient can be slowly increased. It is important that he gradually increases his levels of activity and participation to prevent the development of a fear of movement or of an imbalance between load and load-bearing capacity.

Treatment goals: increase the patient’s knowledge about and insight into his condition, and improve functions.

Table 4. Physical therapy subgoals in the different phases of treatment, divided according to the time that has elapsed since the injury.

Subgoals	Phase 1 (< 4 days)	Phase 2 (4–21 days)	Phase 3 (3–6 weeks)	Phases 4, 5 and 6 (> 6 weeks)
Reducing pain	X			
Increasing knowledge of and insight into the condition	X	X	X	X
Improving functions		X	X	
Increasing levels of activity and participation			X	X
Promoting an adequate coping strategy			X	X

Table 5: Steps in the process of changing behavior, including movement behavior.

1. Being open to information about the need to change behavior.
2. Being able to understand and recall the information received.
3. Wanting to change behavior.
4. Being able to change behavior.
5. Demonstrating the new behavior (doing).
6. Keeping on doing the new behavior over the long term.

Interventions: counseling, including the provision of information and advice, and giving exercise therapy.

#### ***Providing information and advice***

The physical therapist should inform the patient about the nature of the injury and the expected course of recovery and explain that moving in a well-balanced way is not harmful but instead benefits recovery, even if it causes a reaction, such as pain. The patient learns to cope with his symptoms and learns how to increase his level of activity, while bearing in mind: the balance between load and load-bearing capacity; the need to divide time into periods of rest and periods of activity; and the instructions on posture he has received.

It is important that the patient learns to increase his activity level in a manner that is neither too slow nor too fast. If the load on the patient is too low, the physical therapist should explain that it is important to increase activity level. If the load on the patient is too high, he should be instructed to slow down. If it is desirable, the patient's load could be low at the beginning of the recovery period, after which it could be increased gradually to the highest level feasible.

The physical therapist should regularly evaluate whether the patient understands the information provided and whether he can apply the advice received in his own environment. In conjunction with the patient, the physical therapist should seek solutions to any problems the patient experiences in following advice.

When recovery is normal, the patient will himself increase his levels of activity and participation. Consequently, behavioral change is unnecessary. The physical therapist should encourage the healthy

movement behavior and help the patient to consolidate it. These activities correspond to steps 5 and 6 in the process of changing behavior (i.e., doing, and keeping on doing) described in Table 5.

When recovery is abnormal or when the patient has an inadequate coping strategy, the physical therapist must try to change the patient's behavior, for example, by helping him recognize his limitations in terms of the tempo, duration, number and nature of his activities and by helping him increase his load gradually.

For successful behavioral change, it is essential that the patient trusts his own abilities (i.e., experiences self-efficacy) and that the advantages of the change outweigh the disadvantages. This means that the physical therapist, together with the patient, should set achievable goals and that the advantages and disadvantages of the behavioral change should be discussed. Furthermore, it is important that the therapist provides information systematically and gradually in a way that takes into account the patient's knowledge and perceptions. The form and content of the information has to match the phase of behavioral change that the patient is in. Following the steps listed in Table 5 can be helpful in bringing about behavioral change. Note that it is only when one step has been completed that the next step can be taken.

#### ***Exercise therapy***

The objective of exercise therapy is to improve selected functions and activities. The patient may also experience positive behavioral changes.

#### **Phase 3 (three to six weeks after the injury)**

In this phase, the patient's functions are improved

and the load on the patient is increased. Pain no longer plays a central role. The aim is to increase the patient's activities gradually and to help the patient return to as normal a level of participation as possible. If necessary, the physical therapist should encourage the patient to adopt a more adequate coping strategy.

Treatment goals: increase the patient's knowledge about and insight into his condition, improve functions, increase levels of activity and participation, and encourage an adequate coping strategy.

Interventions: counseling, including the provision of information and advice, and giving exercise therapy.

#### ***Providing information and advice***

The physical therapist should encourage patients whose recovery is normal to carry out their usual activities and to participate socially as much as possible. The physical therapist and the patient should discuss how best to cope with the condition and how to increase activity levels, while taking into account advice given in the section on providing information and advice in phase 2. In patients whose recovery is delayed or who have an inadequate coping strategy, the physical therapist should attempt to change the patient's movement behavior, as detailed in phase 2.

#### ***Exercise therapy***

Patients who have a fear of movement or who avoid moving should be exposed to a gradual safe increase in their loads. To achieve this, the physical therapist should select, together with the patient, activities that the patient is afraid of, and these should be practiced. The objective is for the patient to have a positive experience of carrying out the selected actions. The size of the steps taken depend on the patient's starting level (i.e., the baseline measurement), the ultimate goals that have been formulated for the individual patient, and the patient's progress. Furthermore, practical functions and activities are exercised. In improving functions such as muscle strength, it is useful to follow physiological exercise principles.

#### **Phase 4 (six weeks to three months after the injury)**

If there is no progress in terms of levels of activity and participation in this period, recovery is delayed. Depending on the patient's load-bearing capacity, therapy should begin with either a recovery period, in which the load is lowered, or with a period of increased load. The patient's coping strategy is of central importance in treatment.

Treatment goals: increase the patient's knowledge about and insight into his condition, improve functions, increase levels of activity and participation, and encourage an adequate coping strategy.

Interventions: counseling, including the provision of information and advice, and giving exercise therapy.

#### ***Providing information and advice***

The physical therapist tries to change the patient's movement behavior or encourages the patient to continue with the new movement behavior by providing information and advice, as detailed in the section on providing information and advice in phase 2. This involves encouraging an increase in the levels of activity and participation, and controlling or influencing, if possible, the impact inhibitory factors have on the patient's level of participation. In particular, special attention must be paid to participation in the workplace during this phase. It is important to assess the influence of inhibitory factors in the patient's work environment so that the patient can anticipate their effects and so that the physical therapist can pay attention to them during treatment. Preferably, an occupational physician should be consulted.

#### ***Exercise therapy***

Exercise therapy consists mainly of exercising and time-expanding of relevant activities. In the exercise program, exercise duration is gradually increased while the balance between load and load-bearing capacity is monitored. The training of specific functions is clearly associated with improvements in levels of activity and participation.



**Phases 5 and 6 (more than three months after the injury)**

The longer the impairments, disabilities and participation problems persist, the smaller the chance of full recovery to the health status before the accident. In these phases, treatment is the same as in phase 4.

**Evaluation**

The physical therapist should regularly evaluate the results of treatment during therapy by monitoring the course of the complaints, the patient's coping strategy, and his levels of activity and participation. The measuring instruments mentioned in the description of the diagnostic process can be used for this purpose. The treatment plan can be modified on the basis of these evaluation, if necessary. If treatment is having no effect, the physical therapist should contact the referring physician or refer the patient back to him. Treatment ends when the treatment goals have been achieved or when further treatment is not expected to produce positive results.

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**Final evaluation, conclusion and reporting**

The referring physician should be informed at the end of the treatment, and possibly during treatment, about individual treatment goals, the treatment process and treatment results. Information on how to do this is given in guidelines issued by the Royal Dutch Society for Physical Therapy (KNGF), entitled "Communicating with and reporting back to general practitioners". Written reports should conform to KNGF guidelines, entitled "Physical therapeutic documentation and reporting."

## Review of the evidence

### General introduction

The guidelines on whiplash-associated disorders issued by the Royal Dutch Society for Physical Therapy (KNGF) provide a guide to the physical therapy of adult patients suffering from whiplash-associated complaints, which are described in terms of impairments, disabilities and participation problems. The guidelines describe a methodical approach to the diagnostic and therapeutic processes involved.

### Definition

KNGF guidelines are defined as “a systematic development from a centrally formulated guide, which has been developed by professionals, that focuses on the context in which the methodical physical therapy of certain health problems is applied and that takes into account the organization of the profession”.<sup>1,2</sup>

### Objective of the KNGF guidelines on whiplash-associated disorders

The objective of the guidelines is to describe the optimal physical therapy, in terms of effectiveness and efficiency, for patients with complaints or health problems caused by whiplash as derived from current scientific research and from professional and more general knowledge. The care provided should lead to full, or desired, levels of activity and participation and should help prevent the development of chronic complaints and recurrences.

In addition to the above-mentioned guideline goals, KNGF guidelines are explicitly designed:

- to adapt the care provided to take account of current scientific research and to improve the quality and uniformity of care;
- to define and provide some insight into the tasks and responsibilities of professional groups and to stimulate cooperation; and
- to aid the physical therapist's decision-making process with regard to deciding whether to treat and to assist in the use of 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.

### Main clinical questions

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

- What is the natural course of recovery from whiplash injury and which prognostic factors predict the course of recovery?
- Which factors can be influenced by physical therapy?
- What is the objective of physical therapy in patients suffering the consequences of whiplash?
- Which parts of the physical therapy diagnostic process are valid, reliable and useful in daily practice?
- Which forms of treatment and prevention produce clinically significant results?

### The monodisciplinary working group

In October 1998, a monodisciplinary working group of professionals was formed to find answers to these clinical questions. In forming the working group, an attempt was made to achieve a balance between professionals with experience in the area of concern and those with an academic background. All members of the working group stated that they had no conflicts of interest in participating in the development of these guidelines. Guideline development took place from October 1998 through December 2000.

### Monodisciplinary working group procedures

The guidelines were developed in accordance with concepts outlined in a document entitled “A method for the development and implementation of clinical guidelines”.<sup>1-4</sup> This document includes practical recommendations on the strategies that should be used for collecting scientific literature. Below, in this review of the evidence for these guidelines, details are given of the specific terms used in literature searches, the sources searched, the publication period of the searched literature, and the criteria used to select relevant literature.

Although members of the working group selected and

graded the scientific evidence either individually or in small subgroups, the results were presented to and discussed by the whole working group. Thereafter, a final summary of the scientific evidence, which included details of the amount of evidence available, was made. In addition to scientific evidence, other important factors were taken into account in making recommendations, such as the achievement of a general consensus, cost-effectiveness, the availability of resources, the availability of the necessary expertise and educational facilities, organizational matters, and the desire for consistency with other monodisciplinary and multidisciplinary guidelines. If no scientific evidence was available, guideline recommendations were based on the consensus reached within the working group or by a group of professionals.

Once the draft monodisciplinary guidelines were completed, they were sent to a secondary working group comprising external professionals or members of professional organizations, or both, for comments on the recommendations and to ensure that there was agreement with the views of other professional organizations and with any other existing monodisciplinary or multidisciplinary guidelines. In addition, the wishes and preferences of patients were taken into account through consultations with a representative of the Dutch Whiplash Foundation.

#### **Validation by intended users**

Before they were published and distributed, the guidelines were systematically reviewed and tested by intended users for the purpose of validation. The draft KNGF guidelines on whiplash-associated disorders were presented for assessment to a group of 50 physical therapists who had the required skills and who were working in different settings. Physical therapists' comments and criticisms were recorded and discussed by the working group. If possible or desirable, they were taken into account in the final version of the guidelines. The final recommendations on practice, then, are derived from the available evidence and take into account the other above-mentioned factors and the results of the guideline evaluation carried out by intended users.

#### **Composition and implementation of the guidelines**

The guidelines comprise three parts: the practice guidelines themselves, a schematic summary of the most important points in the guidelines, and a review of the evidence. Each part can be read individually. After the guidelines were published and distributed to KNGF members, a scientific article containing the most important guideline recommendations was published.<sup>5</sup> In addition, a professional development module was produced and published to stimulate use of the guidelines in daily practice.<sup>6</sup> A similar module was also developed as a short course for small groups.<sup>7</sup> The emphasis is on practical skills and the intention is to support the implementation of the KNGF guidelines on whiplash-associated disorders. The guidelines should be implemented in accordance with a standard method of implementation.<sup>1-4,8</sup>

#### **Introduction to these guidelines**

This review of the evidence concerns the KNGF guidelines on whiplash-associated disorders. These guidelines are intended for the treatment of patients who are suffering the negative consequences of whiplash. A bio-psychosocial approach has been adopted as the starting point for physical therapy. In these guidelines, the expression "the consequences of whiplash" is used to cover, in a neutral way, impairments, disabilities and participation problems. Because very few controlled studies on whiplash have been carried out so far, guideline recommendations have been based on scientific literature on the treatment of chronic benign pain as well as on scientific literature on the treatment of whiplash. An important similarity between chronic benign pain and the long-term consequences of whiplash is that, in both, bio-psychosocial factors can cause complaints to persist. In addition, in both groups of patients, objective impairments in body structures can often not be detected.<sup>9</sup>

#### **Impairments, disabilities and participation problems**

The physical therapist can describe the patient's complaints and perception of his health problems (i.e., the consequences of whiplash) in terms of impairments, disabilities and participation problems. Impairments are manifestations of a disorder that

involve body structure or body functions (e.g. physiological or psychological functions). Examples are dizziness, pain or impaired sensibility. Disabilities are problems performing activities such as bending, reaching or walking. Participation problems are problems with participation in social life, such as problems participating in work or family life. These concepts are derived from a provisional version of the International Classification of Impairments, Disabilities and Handicaps (ICIDH-2),<sup>10</sup> which has now evolved into the International Classification of Functioning, Disability and Health (ICF). The aim of using these concepts is to increase the uniformity of the language used in physical therapy. In the ICIDH, the terms functioning and dysfunction are used as umbrella concepts to cover impairments, disabilities and participation problems. In the guidelines issued by the Dutch College of General Practitioners (NHG), the term dysfunction is defined as “a level of daily functioning that is not able to fulfill the patient’s demands or the demands made on the patient by his environment in terms of the performance of normal daily activities and work”.<sup>11</sup>

#### **Bio-psychosocial model**

Within the physical therapy profession, it is becoming increasingly important to view pain in terms of the integrated effect of physical, psychological and environmental factors. These factors interact continuously with one another.<sup>12</sup> The physical factors that initially cause pain can become less important over time, even though the disabilities experienced by the patient in his daily life either stay the same or worsen. This phenomenon is due to psychosocial factors.

#### **Guidelines target group**

These guidelines are intended for all physical therapists who individually treat patients suffering the consequences of whiplash. The physical therapy principles described herein can, however, also be used in treatment provided in a multidisciplinary setting or in a group. The physical therapist requires specific knowledge and skills to treat patients suffering the consequences of whiplash in a group setting. The KNGF has developed quality criteria that apply to group treatment. These criteria concern the methods used, the physical therapist’s approach, and the

professional performance.<sup>13</sup>

In order to use these guidelines appropriately, the physical therapist must know about the natural course of recovery from the consequences of whiplash and the significance of prognostic factors. The physical therapist can use this knowledge to judge whether and to what extent the patient’s complaints could be influenced positively. Furthermore, the physical therapist must have experience in providing information in a methodical way so that he can influence the patient’s behavior. He must also be familiar with behavior-oriented principles and how they apply to the patient’s functioning.

#### **Pathophysiology**

##### ***Mechanism***

In contrast to the hyperextension hypothesis used as an explanation for whiplash injury in the past, Panjabi et al.<sup>14</sup> observed, in an in vitro experiment on whiplash injury, that the cervical spinal column undergoes a two-phase reaction during whiplash. In the first phase, the spinal column forms an S shape involving flexion of the upper cervical spinal column and hyperextension of the lower cervical spinal column. In the second phase, extension occurs at all levels of the spinal column. On the basis of their observations, the authors concluded that whiplash injury occurs in the first phase, before the neck is fully extended. Thereafter, the lower cervical spinal column is injured during hyperextension. At higher speeds, there is a tendency for injury to occur in the upper part of the cervical spinal column.

##### ***Connective tissue recovery***

De Morree<sup>15</sup> presented a general model describing physiological recovery in connective tissue after damage. This model describes three partly overlapping phases. These are the inflammatory phase (0–4 days after tissue damage), the fibroblastic phase (4–21 days after) and the remodeling phase (3–6 weeks after). The inflammatory phase is characterized by local reactions to tissue damage. This phase’s duration depends on the extent of tissue damage. After about four days, the formation of new connective tissue begins in the so-called fibroblastic phase. This second phase lasts until the injured region is bridged by connective tissue. During this

period, the load-bearing capacity of the connective tissue is not yet very great. In the last phase, connective tissue strength increases. The tissue is restructured into a form that can resist stretching forces and in which tension corresponds to the force exerted on the connective tissue. These phases may last from many months to more than a year.

### *Consequences of whiplash*

Studies on the consequences of whiplash injury provide no unequivocal conclusions on resulting impairments in body structures. Review articles describe a great number of anatomical structures that may be damaged:<sup>9,16</sup> facet joints, intervertebral disks, muscles, ligaments, atlantoaxial joints, the brain, cervical vertebrae, and the temporomandibular joint. However, imaging investigations carried out just after accidents mostly fail to show soft-tissue defects or indications of soft-tissue damage.<sup>17,18</sup>

Patients' complaints after whiplash are very diverse in nature and duration. Whereas one person may have no complaints after an accident, another may have complaints that last a few weeks, and yet another may have continuing complaints. Persistent complaints can lead to disabilities and problems with social participation that may affect, for example, the

performance of work, hobbies and sports. The symptoms most frequently reported immediately after accidents are neck pain, decreased neck mobility, and headache. In addition, photophobia (i.e., an inability to stand bright light), dizziness, concentration problems, and fatigue may also occur (Table 6).

### **Definition of whiplash**

It is far from clear how to define whiplash. In these guidelines, the definition formulated by the Quebec Task Force on whiplash-associated disorders has been used because this is, at present, the most commonly used definition: "Whiplash is an acceleration-deceleration mechanism of energy transfer to the neck. It may result from rear-end or side-impact motor vehicle collisions, but can also occur during diving or other mishaps. The impact may result in bony or soft-tissue injuries (i.e., whiplash injury), that may, in turn, lead to a variety of clinical manifestations (i.e., whiplash-associated disorders)".<sup>20</sup>

The Quebec Task Force classified whiplash disorders (i.e., whiplash-associated disorder) on two axes: a clinical-anatomical axis and a time axis. The clinical-anatomical axis has five grades of severity: from 0 to

*Table 6. Percentages of patients reporting specific symptoms immediately (i.e., less than four weeks) and six months after accidents involving whiplash. Source: Stovner.<sup>19</sup>*

<b>Symptoms</b>	<b>Immediately after the accident</b>	<b>Six months after the accident</b>
Neck pain	90–100%	10–45%
Decreased neck mobility	40–95%	14%
Headache	50–90%	8–30%
Photophobia	30–80%	–
Shoulder and arm pain	40–70%	5–25%
Dizziness	20–70%	3–20%
Concentration problems	20–60%	5–21%
Fatigue	60%	–
Fear	45–50%	5–12%
Reduced vision	20–45%	3%
Depressive complaints	45%	5–10%
Back pain	35%	–
Insomnia	35%	–
Elevated irritation	20%	9–14%
Paresthesia in the hand	10–15%	–
Loss of libido	–	7%

4 (Table 1). The time axis has six phases: phase 1 covers the period up to four days after the whiplash; phase 2 lasts from four days to three weeks after; phase 3 from three to six weeks; phase 4 from six weeks to three months; phase 5 from three to six months; and phase 6 covers the period more than six months after the whiplash.<sup>20</sup> This classification is based on the physiological tissue recovery process.

### Epidemiology

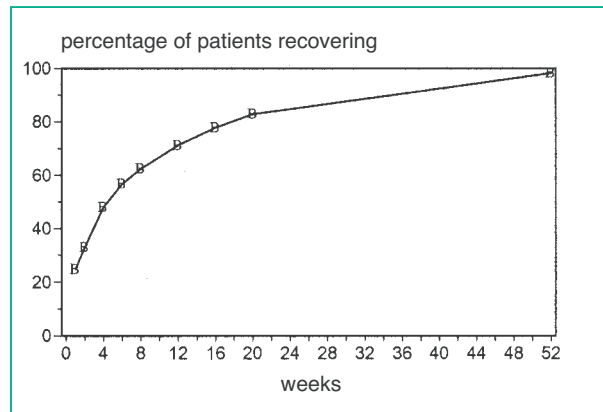
Skovron<sup>21</sup> published an overview of the epidemiology of whiplash. The author reported that incidence figures vary from 16 to 70 per 100,000 inhabitants when whiplash frequency is determined on the basis of insurance company claims. The variability is ascribed to differences in the definition of whiplash, and to differences in road, traffic and population density, driving behavior, the average distance between home and work, social legislation, liability insurance, and car insurance. Using accident statistics, Wismans and Huijskens<sup>21</sup> estimated the number of new patients with whiplash traumas in the Netherlands at 15,000 to 30,000 a year, in a population of about 16 million. This corresponds to an incidence of 94–188 per 100,000 inhabitants a year.

### Prognosis

There is no consistency in the scientific literature on the prevalence of long-term complaints after whiplash or on the course of whiplash-associated disorders. Figures reported in studies show a wide range of variation, partly because of differences in the definitions used, in follow-up periods, and in the purposes of the studies.<sup>23–27</sup> Literature reviews reflect the diversity of results. Stovner<sup>19</sup> reported that six months after accidents, 50–80% of affected persons are free of complaints, whereas Freeman et al.<sup>28</sup> concluded that 19–60% of patients still had complaints after six months. In general, however, the prognosis after whiplash is favorable. Data derived from the Canadian research group, the Quebec Task Force on whiplash-associated disorders, are frequently quoted.<sup>20</sup> They describe a relatively favorable prognosis, as shown in Figure 1.

In patients with whiplash injuries, the median recovery time is 30 days, with recovery being defined

Figure 1. The cumulative percentage of patients recovering after whiplash reported by the Quebec Task Force on whiplash-associated disorders, which defined recovery is as “going back to work”.



as “going back to work”. Some 25% of patients recover within one week and, after a year, 98% have recovered.<sup>29</sup> The Quebec Task Force on whiplash-associated disorders has criticized these data by stating that they underestimate both the severity and duration of the complaints experienced by patients.<sup>28,30</sup> Furthermore, the Task Force stated that, although the study on which the figures were based was indeed extensive, it was carried out in just one country (i.e., Canada). It should be recognized that physical and psychosocial factors and the technicalities of insurance can also influence the reported prognostic data.<sup>29</sup> In a systematic review of prognosis after whiplash, Verhagen et al.<sup>31</sup> concluded that there are substantial differences between studies in terms of their content as well as their methodology, and that the studies’ conclusions are, therefore, not very valid.

### Prognostic factors

Recent opinion about the occurrence of chronic complaints after whiplash injury holds that psychosocial factors are important in maintaining pain complaints.<sup>30,32</sup> In experiments in which volunteers suffered whiplash traumas, chronic complaints did not appear to result. Moreover, there are apparently no chronic complaints after similar whiplash-type traumas suffered during sporting activities. The reason is thought to be that the test subjects know that the neck complaints will disappear after some time. It has also been suggested

Table 7. Summary of factors found in the literature search that indicate an unfavorable prognosis for recovery after whiplash.

**1. Accident-related factors**

- decreased neck mobility<sup>24,26</sup>
- pre-existing head trauma<sup>26,33</sup>
- riding in a bus or truck<sup>29</sup>
- being a passenger<sup>29</sup>
- moving vehicle collision<sup>29</sup>
- frontal or side-impact collision<sup>29</sup>
- similar pre-existing complaint, such as headache<sup>26</sup>
- severe initial consequences of the accident, such as high-intensity neck pain, headache, or changes in psychic or cognitive functioning<sup>26</sup>
- consequences of the accident, such as neck pain or headache, persisting after three or six months<sup>32</sup>

**2. Personal factors**

- female gender<sup>23,29</sup>
- older age<sup>23,26,29</sup>
- being a carer<sup>29</sup>
- no full-time job<sup>29</sup>
- 'stressful life events'<sup>25</sup>

that psychosocial factors explain the frequently observed international differences in the prevalence of chronic complaints after whiplash.<sup>30</sup> The suggestion is that psychological and cultural factors are responsible for persistent pain behavior in patients.

***Whiplash-related factors causing delayed recovery***

A systematic literature search for factors that are prognostic for delayed recovery after whiplash was carried out using the following key words: whiplash, neck injury, neck sprain; prognosis, predictive, recovery, evolution; prospective, cohort. The search was performed using the MEDLINE and CINAHL databases, both from 1982 through June 2000. In addition, a manual literature search was also carried out. The process produced 70 references. Thereafter, selection criteria were applied, namely: the article should be in English, French, German or Dutch; the study design should be prospective and involve a cohort; the patients should have suffered whiplash injuries; the publication should not describe the results of specific interventions; and at least one measure of physical functioning should be used. After

applying these criteria, six studies remained.<sup>23–26,29,33</sup>

The result of the search are presented in Table 7. In it, a distinction is made between unfavorable prognostic factors that were found in only one study and those that were found in more than one study. If different studies reported inconsistent findings on a particular prognostic factor, it was not included in the table. Overall, it can be said that knowledge about factors that are prognostic for delayed recovery from the consequences of whiplash is limited. The only factors that were associated with unfavorable results in two or more studies are decreased neck mobility directly after the accident, pre-existing head trauma, gender, and age. With regard to age, it is unclear where the cut-off point for an unfavorable prognosis lies. The guidelines refer only to factors that have been found to confer an unfavorable prognosis in more than one study.

***Chronic pain-related factors causing delayed recovery***

Linton<sup>34</sup> carried out a systematic review of the relationship between psychological factors and back and neck pain. In total, 36 prospective studies were

included. On the basis of several high-quality studies, Linton concluded that psychosocial variables are strongly related to the change from acute pain to chronic pain and disability. It also appears that, in general, psychosocial variables have a greater impact on pain-related disability than bio-medical or bio-mechanical factors. The patient's behavior, attitude and emotions all play important roles. Passive coping, ideas about pain that involve, for example, catastrophizing, and emotions such as depression and fear are all strongly related to pain and disability. There is also moderate to strong evidence that these psychosocial factors may predict the persistence of pain and disability over the long term.

Waddell and Waddell<sup>35</sup> carried out a systematic review of the influence of social factors on back and neck pain. They concluded that there are strong indications that social factors are related to back and neck pain, but that studies into the topic are of only moderate quality. A number of social factors can be related to pain on the basis of the findings of one systematic review or of consistent findings in more than two high-quality studies. These are: low socio-economic class and psychological aspects of work, such as poor job satisfaction. In addition, in patients with neck pain, static load and repetitive movement are associated with pain and disability.<sup>36</sup> The authors of the review emphasized that no social factor can be described as a risk factor for pain, but that social factors may influence pain and the patient's coping strategy.

### **Coping strategy**

Patients may cope with their complaints either adequately or inadequately, depending on whether they have an 'active' or 'passive' coping style. 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".<sup>37</sup> In active coping, individuals undertake actions to control pain by themselves. For example, they seek distraction or move. In passive coping, individuals adopt a predominantly passive attitude by, for example, resting, using medication, becoming dependent on others to control pain, or decreasing activities to reduce pain.<sup>38</sup> Active coping is associated with better functioning, whereas passive coping is

associated with poorer functioning.<sup>38</sup> The way in which a person deals with his complaints is, among other things, determined by the patient's personal characteristics and by his interaction with his environment, including his interaction with the physical therapist.

### ***Patient characteristics***

The significance a patient attaches to his complaints and the feeling of control he has over them are two important characteristics. As it is based on the subjective perception and interpretation of stimuli, the significance a patient attaches to his complaints may not correspond with objective reality. If this is the case, the patient is making a logical error. 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). In addition, 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 that it is mainly controlled by other people or by circumstances (i.e., there is an external locus of control). Some individuals give other people, for example, the physical therapist, control over their health.<sup>39</sup> An internal locus of control is often related to active coping and, subsequently, to a better way of dealing with pain.<sup>38</sup>

Both the significance attached to 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., the patient catastrophizes), there is a significant risk that a fear of movement will result. This is the fear that movement will result in (new) pain or (re)injury. It can, in turn, lead to avoidance.<sup>40</sup> In addition, when, on the basis of previous experience, the patient expects that a certain activity will increase pain in a way over which he has no control, there is a risk that the situation giving rise to this activity will be avoided.

### ***Interaction between patient and environment***

Social support can help an individual deal with setbacks and adjust to change. The most important source of social support is the patient's partner.



Table 8. Practical example of a pain-contingent approach to treatment which does not accord with behavior-oriented principles.

- The patient practices carrying by carrying a five-kilogram box for a certain distance. After walking up and down once, the patient complains about pain. The box is put down and the patient rests briefly. While resting, the patient talks a little until “it’s time to go again”. Then the patient returns to carrying the box.
- What is happening in this process? Carrying is being punished by pain, therefore carrying behavior will decrease, and pain is being rewarded by rest and a nice conversation, therefore resting will increase. The physical therapist must avoid this negative reinforcement of a decrease in activity or movement.
- Therefore, it is advisable to pay much more attention to activity and movement and, thereby, to increasing them. The activity duration should be gradually increased in a time-contingent manner.

Patients with pain who have good social support recover more quickly and return to normal daily activities sooner. On the other hand, certain kinds of social support can also contribute to the maintenance of complaints. 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.

The physical therapist’s attitude and the way in which he approaches the patient’s complaints also appear to influence the course of the complaints. In patients suffering the consequences of whiplash over the long term, it is very important to use a time-contingent approach to treatment, as described below in the section on behavior-oriented principles.

#### **Behavior-oriented principles**

Using behavior-oriented principles involves directing treatment towards the patient’s behavior and the situation producing the behavior rather than towards possible underlying pathological factors or impairments in body structures or body functions.<sup>12</sup> In addition, the patient must actively participate in treatment and a time-contingent approach, meaning that the therapeutic intervention is determined by time and not pain, should be used. Table 8 describes a practical example of a pain-contingent approach to treatment which does not accord with behavior-oriented principles.

#### **Interdisciplinary cooperation**

For the patient, it is important that practitioners of all the disciplines involved in treatment employ the same principles and that unambiguous information

and advice is provided. Cooperation between practitioners of different disciplines is important and treatment agreements made between different practitioners must be consistent. Guidelines on the following topics have been developed to assist communication with primary care physicians: indication setting, letters of referral, consultation, contact during treatment, and writing reports.<sup>41</sup>

#### ***Advisory note issued by the scientific board of the Dutch Whiplash Foundation***

This advisory note concerns the policy that should be adopted by primary care physicians during the initial treatment of whiplash patients.<sup>42</sup> The advisory note states: “The patient’s pain should be treated as aggressively as possible for one week using nonsteroidal anti-inflammatory drugs. The patient should be advised to alter his activities but to stay active at the same time.” The advisory note states that the use of a collar, including a soft collar, should be limited to one week after the accident. Patients are also advised and encouraged to make active head-and-neck movements within the pain-free range. There should be no passive movements. Furthermore, the advisory note makes recommendations on patients’ performance of normal daily activities. Employers have to coordinate the implementation of this advice with an occupational physician. It should be noted that these guidelines do not recommend wearing a collar since no evidence was found to support their use. More information is given in the description of the therapeutic process below.

## Diagnosis

The methodical application of physical therapy involves the adoption of a problem-solving approach.<sup>43</sup> This methodical approach involves the following phases: referral, history-taking, examination, analysis (including the formulation of a physical therapy diagnosis), drawing up a treatment plan, providing treatment, evaluating treatment, drawing conclusions, and report writing.<sup>44-46</sup> In this section of the review of evidence, some aspects of history-taking, examination, and analysis are discussed.

### History-taking

Two important aspects of history-taking are assessing the patient's coping strategy and condition at the time of observation.

1. **Coping strategy.** The physical therapist might ask:  
 What are you yourself doing about your condition? Do you think it is effective? To what extent do you fear that movement is harmful?  
 What do you expect from therapy? Which goals

(especially in terms of activities) do want to achieve?

2. **Assessment of status praesens.** The physical therapist should ask systematically about the patient's different functions, activities and types of participation (Table 9). The physical therapist should also assess whether the demands made on the patient by himself and his surroundings match his load-bearing capacity.

### Measuring instruments

*Visual analogue scales.* A visual analogue scale can provide a reliable, valid and simple way of measuring pain.<sup>47</sup> These types of scales can also be used to assess other subjective variables, such as fatigue, functioning and quality of life.<sup>48</sup> It is recommended that visual analogue scales are used to evaluate the 'most important complaints' in patients suffering the consequences of whiplash. These may be, for example, pain intensity or fatigue. In essence, a visual analogue scale consists of a horizontal line 10 cm in length on which the patient indicates the severity of his most important complaint by marking a narrow

Table 9. Examples of functions, activities and types of participation.<sup>10</sup>

<p><b>Functions:</b></p> <ul style="list-style-type: none"> <li>• mental functions: sleep behavior, attention span, memory, thought processes, language use, counting ability, and mood;</li> <li>• sensory functions: senses of vision, hearing, balance and taste;</li> <li>• locomotion: joint and bone function (e.g., mobility and stability), muscle function (i.e., strength, tonus and endurance), and movement patterns (gait, involuntary movements, and voluntary movements).</li> </ul> <p><b>Activities:</b></p> <ul style="list-style-type: none"> <li>• basic movements: maintaining or changing body posture, and carrying, moving and manipulating objects;</li> <li>• moving from place to place: walking and using transport;</li> <li>• self-care activities: washing, dressing, eating and drinking;</li> <li>• domestic activities: preparing meals, taking care of property, and assisting others.</li> </ul> <p><b>Participation in:</b></p> <ul style="list-style-type: none"> <li>• personal care;</li> <li>• mobility (inside and outside the home);</li> <li>• social activities;</li> <li>• domestic life and helping others;</li> <li>• education;</li> <li>• work or profession;</li> <li>• social and community activities, including recreational and free-time activities.</li> </ul>
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vertical line. The wording 'no complaints' is written at the left end of the scale and 'very severe complaints' at the right end. The distance between the left end of the scale and the vertical line marked by the patient indicates the severity of the patient's most important complaint. The time period to which the assessment applies must be standardized. For example, by asking: What was the severity of your most important complaint during the last week?

*Neck disability index.* The neck disability index<sup>49</sup> is based on a questionnaire about the symptoms, disabilities and participation problems that patients may experience as a consequence of whiplash. The questionnaire consists of 10 items: pain intensity, headache, concentration ability, sleep behavior, lifting ability, working ability, car-driving ability, recreational activities, performing personal care, and reading habits. The 10 items are scored on an ordinal scale from 0–5 and the maximum score is 50.

The results of an early study carried out by Vernon and Mior<sup>49</sup> indicate that the neck disability index is a reliable and responsive measure in patients suffering the consequences of whiplash. In a later review, Vernon<sup>50</sup> reported that several studies confirmed these earlier findings. Vernon concluded that the neck disability index is a useful measuring instrument for whiplash patients which can be used in investigations as well as in daily practice. Stratford et al.<sup>51</sup> estimated that the smallest change that can be detected using the index is 4.7 points. This means that, in practice, if there is a five-point difference or greater between the patient's index score before treatment and the score after treatment, the patient's symptoms, disabilities and participation problems really have changed. If the difference is three points or less, it is unlikely that a change has occurred, whereas a difference of seven points or more indicates a significant change. The neck disability index can be applied by the patient himself. Answering the questionnaire takes three minutes on average.

*Daily diary.* The patient is asked to keep a list of activities for one week. He must write down the different types of activity he is involved in on about 10 occasions throughout the day. Subsequently, the

patient indicates how much time he spends on these different activities and how his complaints are influenced by these activities (i.e., increased, decreased or unchanged). This process helps the physical therapist obtain some insight into the type and duration of the patient's different activities and the influence that the patient's complaints has on the performance of these activities. By combining the activity list with the results of carrying out a visual analogue scale assessment for each activity, it becomes clear which activities result in numerous complaints and which result in only a few. Moreover, by noting what the patient does when the level of a complaint increases (e.g., taking medication or seeking distraction), the physical therapist can see how the patient copes with his complaints in terms of his activities. This information can be used to formulate an individual treatment plan for the patient. Moreover, it can indicate the type of advice that should be given and can aid evaluation.

#### **Physical examination**

Physical examination forms part of the diagnostic process. The examination strategy adopted depends on the information obtained during history-taking.

#### *Test for examining functions*

The co-ordination test described by Lanser<sup>52</sup> and Verhagen et al.<sup>53</sup> can be used to assess muscular stability of the cervical spine. In this test, the patient lies in supine position while the physical therapist pushes gently in a ventral direction. The patient is asked to resist this pressure. The test result is positive when there is no local reaction in the cervical muscles. A study carried out by Verhagen et al.<sup>31</sup> indicated that patients who are suffering the consequences of whiplash have a positive result more often than healthy individuals.

#### **Balance tests**

Brinkman et al.<sup>54</sup> described five tests of balance: walking along a raised wooden plank, Romberg's test, standing on one leg, adopting a tightrope walker's gait, and hopping. Three of these tests are not covered by these guidelines: Romberg's test and walking along a raised wooden plank are excluded because patients suffering the consequences of whiplash almost always have maximum scores on

these tests, and the hopping test is excluded because it appears to be unreliable.<sup>55</sup> However, the following are recommended:

- **Standing on one leg:** In this test, the patient stands for as long as possible on one leg (for a maximum of 30 seconds). In turn, the patient stands on his dominant and, then, non-dominant leg. The patient makes two attempts on each leg. The arms are positioned alongside the body. The patient may move his torso a little so long as his foot remains on the ground. The number of seconds the patient can stand is noted and constitutes the final score.
- **Tightrope walker's gait:** In this test, the patient walks very slowly along a 3-meter long line on the ground, stepping heel to toe. After one practice attempt, the test must be performed as quickly and precisely as possible while the physical therapist records the time taken using a stopwatch. Three seconds are added to the final time for each mistake made, such as when the foot is not placed on the line or when the heel does not touch the toe. Finally, a total score is calculated (i.e., the final time plus any penalty times) by taking the mean of the scores from two attempts.

Carrying out an otoneurologic examination, such as Romberg's test or Unterberger's test, is not recommended for physical therapy diagnosis in patients suffering the consequences of whiplash because these tests have little diagnostic value.<sup>54,56</sup>

### Analysis

During treatment, a distinction is made between whiplash patients in whom recovery is normal and those in whom recovery is delayed. The characteristics of delayed recovery may include:

- persistent pain;
- a decreased level of activity or social participation;
- more general complaints, such as fatigue, poorer general physical load-bearing capacity, or depressive complaints;
- increasing fear of movement;
- no response to treatment; and
- increasing patient requests for medical examination or treatment.

In the analysis, it is decided whether physical therapy is indicated and whether the guidelines can be followed during treatment on the basis of referral data combined with the results of history-taking and the physical examination.

### Therapy

In this section, firstly, evidence supporting the therapeutic process adopted is presented and, subsequently, the process is described. Guideline recommendations are based on a systematic search of the literature on the effectiveness of physical therapy in patients suffering the consequences of whiplash. The search was carried out using the following databases: MEDLINE (1982 through June 2000), CINAHL (1982 through June 2000), the Cochrane Library (1999:4), and the database of the Dutch Institute of Allied Health Professions (NPI) documentation center (up to July 2000). The keywords used were: whiplash, neck injury, neck sprain; physical therapy, physiotherapy, behavioral therapy, massage, education, manipulation, mobilization, electrotherapy; systematic review, meta-analysis, randomized clinical trial and randomized controlled trial. In addition, literature was provided by members of the working group and was sought manually.

The literature search on the effectiveness of physical therapy in patients suffering the consequences of whiplash resulted in 35 publications. For inclusion, the following criteria also had to be satisfied: the publication had to be in English, German, French or Dutch; the publication had to describe a systematic review, a meta-analysis or a randomized clinical trial; the study had to concern only whiplash patients; and the treatment used had to involve physical therapy interventions and other intervention that lie within the scope of physical therapy as applied in the Netherlands. After applying these criteria, 14 publications remained.

A second search was performed, this time on the effectiveness of physical therapy in chronic pain. Here, in part, the same keywords were used as in the first search. The difference was that the patient population was defined by the keyword 'chronic pain'. This search generated 100 publications. The

inclusion criteria with regard to publication language and to the interventions used were the same as for the first search. In addition, the following criteria were important: the design had to be a systematic review or a meta-analysis; and the study had to involve persons with chronic benign pain of the locomotor (i.e., musculoskeletal) system. Studies involving combined groups of patients or patients with specific disorders such as rheumatism or osteoarthritis were excluded. After applying these criteria, six publications remained.

### Supporting evidence

#### *Evidence on the effectiveness of physical therapy after whiplash*

Peeters et al.<sup>57</sup> performed a systematic review of conservative treatment in patients with whiplash injuries. Eleven studies were included. Three were of sufficiently high methodological quality.<sup>58–60</sup> The study by Foley-Nolan et al.<sup>58</sup> investigated the efficacy of pulsed high-frequency electromagnetic therapy, 27 MHz for eight hours a day, provided by a small device built inside the collar. However, as such devices are not available in the Netherlands, this intervention falls outside the scope of physical therapy in the country and, thus, the findings were not considered. The study by Provinciali et al.<sup>59</sup> compared multimodal treatment, which included a combination of relaxation, postural and eye-fixation exercises, counseling, and manual techniques, with different physical modalities, including transcutaneous electrical nerve stimulation (TENS), pulsed high-frequency electromagnetic therapy, ultrasound therapy and iontophoresis. The average time that had passed since the patients experienced the whiplash injuries was 30 days. Over the short term as well as the long term, multimodal treatment was found to have more positive effects in terms of pain and 'global' effect. Moreover, the patients who received multimodal treatment went back to work sooner than those who received treatment with the physical modalities. Provinciali et al. recommend multimodal treatment in patients with complaints due to whiplash. The study by Borchgrevink et al.<sup>60</sup> examined the long-term effects of the advice that was given in the first 14 days after the accident. One group was advised to stay active, while the other was advised to rest for 14 days and to wear a soft collar.

After six months, symptoms had decreased in both groups. Patients in the group that was advised to stay active experienced less pain and stiffness. On the basis of these results, it can be concluded, with some caution, that active interventions have a more positive influence on the chosen outcome parameters than resting in patients with whiplash injuries. These results are supported by three other studies, which are methodologically of poor quality.<sup>61–63</sup> Another methodologically poor-quality study found no difference between immobilization and no treatment at all.<sup>64</sup>

Peeters et al.'s conclusions are, to a large extent, in agreement with those of Magee et al.<sup>65</sup> and those of the Quebec Task Force.<sup>20</sup> Magee et al.<sup>65</sup> carried out a systematic review of the effectiveness of physical therapy interventions for neck injury after trauma. The review covered eight studies, among which were three that had no control groups or in which patients were not randomized, or both. All studies were considered as methodologically poor. The results showed that exercise, manual therapy and postural advice are all moderately effective in whiplash patients. They also indicated that the use of a collar or resting is ineffective in this group of patients. The authors emphasized the need for good-quality randomized clinical trials in this area. In 1995, the Quebec Task Force published a 'best evidence' synthesis on, among other subjects, the most effective treatments in whiplash patients. The authors concluded that use of a collar does not decrease neck mobility and that wearing a collar can lead to general inactivity, which can delay recovery in this group of patients. They also concluded that long periods of rest can harm recovery and that mobilizing exercises can be used in addition to actively encouraging activity. Furthermore, the authors stated that exercise used as part of multimodal interventions may have positive short-term and long-term effects. A study of the effects of traction showed no statistically significant clinical effects. The effectiveness of improving and giving advice on posture, electrotherapy, ultrasound therapy, laser therapy, short-wave therapy, the application of warmth, the application of ice, and massage was not studied, although some interventions were used in combinations as control interventions. The studies

on high-frequency electrotherapy<sup>58,66</sup> were covered by Peeters et al.'s review.

A more recent randomized clinical trial<sup>67</sup> was not included in the above-mentioned reviews. In this study, the effects of treating whiplash patients by early mobilization were compared to the effects of standard treatment, comprising rest, receiving advice, and use of a collar. In addition, the trial investigated whether it is more beneficial to start treatment early (i.e., within four days after the accident) or late (i.e., 14 days after the accident). Early treatment using mobilization comprised active exercises, in which recurrent movements in different directions were practiced each hour, and postural improvement, which was carried out in accordance with McKenzie's principles. Standard treatment comprised receiving an information brochure containing advice on activities and instructions on postural correction, resting, and use of a soft collar, followed several weeks after the accident by the start of a program of active movements carried out two to three times a day. The researchers concluded that active mobilization produced better results after six months, in terms of less pain, than standard treatment. Moreover, the effects of early mobilization were better when treatment was started within four days, whereas starting standard treatment after 14 days produced better results.

#### ***Evidence on the efficacy of physical therapy in chronic pain***

Morley et al.<sup>68</sup> performed a systematic review and meta-analysis of the efficacy of treatment programs that followed behavior-oriented principles in adults with chronic pain. They concluded that these programs were especially effective in influencing pain behavior, the level of pain experienced, mood, and social functioning compared to no treatment. Gross et al. carried out two literature reviews of the effectiveness of conservative treatment in patients with mechanical neck pain: one concerned the effectiveness of physical therapy interventions<sup>69</sup> and the other, the effectiveness of providing patient education.<sup>70</sup> The authors concluded that the studies they found gave little information on the effectiveness of physical therapy interventions or on patient education in those with mechanical neck

pain. The most important reason for this conclusion was the poor methodological quality of the studies. Furthermore, the search carried out for the reviews was limited to the period 1985–1993. It was also noted that the effectiveness of providing information and advice as a separate intervention in rehabilitation programs for patients with chronic complaints cannot always be demonstrated. However, combining exercise therapy and psychoeducational interventions (e.g., individual instruction, information programs, self-efficacy programs, informative material, and behavioral therapy) in the form of multimodal therapy can increase the effects of the treatment.<sup>71,72</sup>

Van Tulder et al.<sup>73</sup> delineated the efficacy of several different types of conservative treatment for chronic low back pain with the help of a systematic review. They concluded that there are strong indications that exercise therapy and multidisciplinary programs are effective in patients with chronic low back pain. In addition, there were moderately strong indications that behavioral programs and 'back schools' are effective. There were no clear indications on whether advice to stay active, bed rest, physical treatment modalities, or transcutaneous electrical nerve stimulation are effective. Biofeedback using electromyography and traction were found to be ineffective.

Hilde and Bø<sup>74</sup> performed a systematic review of the efficacy of exercise in patients with low back pain. In it, they evaluated whether any differences in the results found could be explained by differences in the methodological quality, type or intensity of the exercises given. They concluded that these variables did not explain the differences found in the efficacy of the exercises used for chronic low back pain.

#### ***Implications for the guidelines***

On the basis of the results of two controlled studies, these guidelines recommended not wearing a collar. Patients who are wearing collars on referral for physical therapy should be advised to reduce their use. In patients with whiplash injury, active treatment seems to give better results than passive treatment. Therefore, an active policy has been adopted in these guidelines and patients are encouraged to take up activities again and to

participate socially again as soon as possible. Neither the effectiveness of adopting a behavior-oriented approach nor of providing information has been specifically studied in patients suffering the consequences of whiplash. However, because the use of behavior-oriented principles has positive effects in patients with chronic pain, these guidelines advise the use of behavior-oriented principles in patients suffering the consequences of whiplash. Moreover, because patient education used in combination with exercise therapy is more effective than exercise therapy alone in patients with chronic complaints, this combination is recommended in these guidelines.

### **Description of therapy**

#### ***Phase 2 (four days to three weeks after the injury)***

During therapy, a distinction is made between patients whose recovery is normal and those whose recovery is delayed. When recovery is delayed, the patient's coping strategy might play an important role. For example, the patient may start too many activities too soon or too few activities too slowly.

Nordin<sup>75</sup> outlined the ideas on providing information and advice produced by the Quebec Task Force on whiplash-associated disorders. Patients should be reassured by explaining to them that most consequences of whiplash are self-limiting and benign. It should also be explained that, although it may be a little painful, movement is not harmful in grade-1 whiplash-associated disorders. In grade-2 whiplash-associated disorders, activity should be increased after consultation with the primary care physician or physical therapist.

In the guidelines, a distinction is made between training and exercising. The term training refers to working according to physiological training principles, for example, to improve muscle function or general stamina. An example would be training at an intensity of 60–70% of maximum muscle strength or maximum heart rate three times a week. Exercising, on the other hand, does not necessarily have to follow these training principles. There are other goals, such as decreasing fear of movement or improving coordination.

#### ***Providing information and advice***

Effective education requires knowledge, educational skills, and the use of some behavioral techniques. Van der Burgt and Verhulst<sup>76</sup> presented an overview of the different educational models used in counseling and translated them into a patient education model for use by allied health professionals. They integrated the Attitude, Social Influence and Personal Efficacy determinant model with Hoenen et al.'s step-by-step educational model.<sup>77</sup> In the Attitude, Social Influence and Personal Efficacy determinant model, it is hypothesized that readiness to change behavior is determined by an interplay between the patient's attitude (how the individual perceives the change in behavior), social influences (how others see the change in behavior), and the patient's perception of his own efficacy, his self-efficacy (whether the patient thinks it will work or not). Hoenen et al.'s educational model identifies the steps of 'being open', 'understanding', 'wanting' and 'doing'. With the practice of allied health professionals in mind, van der Burgt and Verhulst added another two steps: 'being able' and 'keeping on doing'. Van der Burgt and Verhulst regard education as a process in which the maintenance of new behavior is the last step. This final step cannot be taken if the preceding steps have not been completed. Hence, the six steps must be taken in succession (Table 10). The physical therapist must have knowledge about and an insight into the factors that influence the desired behavioral change, whether positively or negatively.

#### ***Education plan***

The physical therapy treatment program should include a separate education plan for the patient, in which subgoals are formulated for each step (Table 11). The education plan should be seen as a component of the methodical approach adopted to providing physical therapy. During history-taking, the patient's need for information is assessed: it must be determined what the patient knows about the disorder, about any medications that may have to be taken, and about healthy lifestyles. For each of these items, attention must be paid to any problems the patient encounters. As a consequence, this approach can provide an insight into the possible causes of any problems the patient has in complying with therapy or with adopting a healthy lifestyle. In evaluating the

Table 10. The six steps in the process of patient education.

1. **Being open:** the physical therapist acknowledges the patient's experiences, expectations, questions and worries.
2. **Understanding:** information must be presented in such a way that the patient is able to understand and remember it.
3. **Wanting:** the physical therapist evaluates what does or does not drive the patient to exhibit a certain behavior. The physical therapist offers support and provides information about alternative possibilities.
4. **Being able:** the patient must be able to perform the desired behavior. Functional activities are exercised.
5. **Doing:** the physical therapist makes clear, specific, feasible agreements with the patient, sets specific targets, and evaluates the extent to which the patient is able to satisfy the agreements.
6. **Keeping on doing:** during treatment, the physical therapist must talk with the patient about whether or not he thinks he will be able to exhibit and continue to exhibit the new behavior.

provision of information and advice, the physical therapist can ask himself: "Does the patient know what he should know? Is he doing what he should do?"

#### *Exercise therapy*

Examples of relevant exercises are:

- when there is impaired cervical muscle stability, isometric contractions should be practiced in the area concerned, with contractions being adapted to suit functional situations;
- when there is impaired balance or dizziness, improvement is sought by practicing the maintenance of balance while standing and walking. It is possible to vary position (e.g., the size of a supporting surface or its center of gravity), tempo (e.g., by slowing down or accelerating) and visual control (e.g., by fixing the line of vision on a fixed or moving point).

#### **Phases 3, 4 and 5 (from three weeks onwards)**

Treatment aims to enable patients to bear activity or, if necessary, to learn new activities. This process is gradually expanded by means of a program in which activities are progressively performed for longer (i.e., operant reconditioning using 'graded activity'). The purpose of the program is to increase the patient's activity level and to decrease pain behavior. The ultimate goal is to achieve the desired level of activity despite the presence of pain.<sup>12</sup>

Treatment starts with a baseline assessment in which the lengths of time the patient is able to perform the

chosen activities are measured. Subsequently, a treatment plan is devised which enables the desired final goal to be achieved from the baseline level within the treatment period. In the first treatment session, the time during which the activity is exercised is less than that in the mean baseline measurement. Gradually, activities are performed for longer. One of the agreements made about treatment is that the patient should exercise for no less, but also no more, than the agreed duration. Also, the patient should exercise at home and record his own progress. If the patient wants to perform an activity he is not yet able to perform, that activity should be divided into a number of separate parts. Each part should be exercised sequentially so that, eventually, the patient is able to perform the whole activity.

#### *Examples of relevant exercises*

- Attention span and memory can be improved by the performance of double tasks such as counting or catching a ball while walking. The physical therapist can also advise the patient to increase gradually his performance of complex tasks such as solving crossword puzzles or reading newspapers. These can be assignments to be carried out at home.
- For cervical spine impairment, exercises are given to mobilize the neck. Subsequently, the different exercises are extended to include functional situations such as visually following a moving ball.



Table 11. The details of providing information and advice to patients suffering the consequences of whiplash. Source: Treatment protocol for the whiplash trial.<sup>78</sup>

Providing information and advice forms part of counseling. The physical therapist acknowledges the patient's pain symptoms, answers the patient's questions, and clears up any uncertainties the patient may have.

**Providing information and advice on:**

- the benign natural course of recovery from the consequences of whiplash;
- the absence of severe pathology;
- the active and influential role the patient has with regard to his own recovery;
- movement, including the fact that movement is harmless;
- body posture with regard to work, housekeeping, hobbies and sporting activities, including:
  - the influence of postures that place a long-lasting static load on the cervical spine (e.g., when reading a book, watching television or painting the ceiling); these postures have to be avoided during the first two weeks of treatment;
  - ergonomic factors affecting the workplace and working posture;
  - aspects of personal care (e.g., the need to avoid washing hair in the sink);
  - sporting activities (e.g., the need to avoid jarring movements, sporting activities involving physical contact, and sporting activities involving the lengthy use of one side of the body, and the importance of activities involving movement in general);
- the balance between load and load-bearing capacity;
- the influence of prognostic factors related to the cause and persistence of complaints (e.g., bio-psychosocial factors), including:
  - the influence of coping strategy on the maintenance of complaints;
  - the influence of fear of movement on the maintenance of complaints;
- the importance of consistently performing exercises and activities at home to achieve the optimal treatment result.

**Learning about activities in terms of:**

- the structured division of the day into alternate periods of loading and periods of recovery. The time during which the load is applied is determined by the mean time during which the patient can perform the activities without symptoms increasing;
- performing activities in a time-contingent manner (with regard to loading);
- adjusting the level of activity with respect to recovery. (Which activities increase symptoms and how long do these activities have to be performed?);
- coping with possible exacerbations or recurrences (in this, the balance between load and load-bearing capacity must be taken into account).

**Conclusion and reporting**

The KNGF guidelines entitled "Communicating with and reporting back to general practitioners"<sup>79</sup> stipulate that the referring physician should be informed at the end of the treatment, and possibly also during treatment, about the patient's individual treatment goals, the treatment process, and the results of treatment, among other things. Details of

how reports should be written are given in the KNGF guidelines entitled "Physiotherapeutic documentation and reporting".<sup>80</sup>

**Legal significance of the guidelines**

These guidelines are not statutory regulations. They provide knowledge and make recommendations based on the results of scientific research which

healthcare workers must take fully into account if high-quality care is to be provided. Since the recommendations mainly refer to the average patient, healthcare workers must use their professional judgement to decide when to deviate from the guidelines if that is required in a particular patient's situation. Whenever there is a deviation from guideline recommendations, it must be justified and documented.<sup>1,2</sup> Responsibility, therefore, resides with the individual physical therapist.

### Revisions

These KNGF guidelines are the first such clinical guidelines to be developed for diagnosis, treatment and prevention in patients suffering from the consequences of whiplash. Subsequent developments that could lead to improvements in the application of physical therapy in this group of patients may have an impact on the knowledge contained in these guidelines. The prescribed method for developing and implementing guidelines proposes that all guidelines should be revised a maximum of three to five years after the original publication.<sup>1,2</sup> This means that the KNGF, together with the working group, will decide whether these guidelines are still accurate by 2006 at the latest. If necessary, a new working group will be set up to revise the guidelines. These guidelines will no longer be valid if there are new developments that necessitate a revision.

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

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## Glossary

<b>Activity</b>	Execution of a task or action by an individual
<b>95% confidence interval</b>	A range of values within which there is a 0.95 probability that the real value of a measured parameter is included
<b>Disability</b>	Inability to perform an activity in the manner or to the extent considered normal for that person
<b>(Body) functions</b>	Physiological functions of body systems (including psychological functions)
<b>Impairment</b>	Problem with body function or structure, such as a significant deviation or loss
<b>Meta-analysis</b>	An overview article which involves a systematic search of the scientific literature. A single conclusion is reached by (quantitatively) combining the results of all the studies found
<b>Participation</b>	Involvement in a life situation
<b>Participation restriction</b>	Problem an individual may experience with involvement in a life situation
<b>(Body) structure</b>	Anatomical part of the body, such as an organ or limb or its component
<b>Systematic review</b>	An overview article which involves a systematic search of the scientific literature. The conclusions describe (qualitatively) the results of all the studies found

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