

Supplement to the Dutch Journal of Physical Therapy
Volume 116 / Issue 5 / 2006

KNGF-Guideline

for Physical Therapy in patients
with acute ankle sprain

Acute ankle sprain Practice guidelines



Royal Dutch Society for Physical Therapy

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

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The KNGF represents 20,000 members. The Society's most important activities are: promoting members' interests, improving the quality of the practice of physical therapy and strengthening the position of physical therapists in the Netherlands. In order to further the quality of physical therapy practice, KNGF has invested in Quality Assurance programs, one of which has led to the development of Clinical Practice Guidelines.

Contents

Practice Guidelines

Introduction	1
I Screening process	4
I.I Presentation	4
I.II Problem identification	4
I.III Screening for pathology requiring medical attention	4
I.IV Information and advice	4
II Diagnostic process	4
II.I History-taking	5
II.II Examination	5
II.III Measurement instruments	7
II.IV Analysis	7
II.V Conclusion	8
III Therapy	8
III.I Acute ankle sprain	8
III.I.I Goals	8
III.I.II Procedures	9
III.II Functional instability of the ankle	10
III.II.I Goals	10
III.II.II Procedures	11
III.II.III Evaluation	11
III.III Preventing ankle injuries	12
III.IV Concluding the treatment and reporting	12

Supplements

13

Supplement 1	Conclusions and recommendations	14
Supplement 2	Measurement instruments	18
Supplement 3	Glossary	25

KNGF Guideline for Physical Therapy in patients with acute ankle sprain - Practice Guidelines

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Introduction

This KNGF guideline replaces the KNGF guidelines on 'Acute Ankle Sprain' (1998) and 'Chronic Ankle Sprain' (2003) and concerns the physical therapist's diagnostic and therapeutic process for patients with an inversion trauma of the lateral capsular ligamentous complex or for patients with functional instability of the ankle, including measures to prevent recurrence of the injury. In addition, the guideline offers recommendations for sports-specific treatment and rehabilitation after acute ankle sprain or functional instability among athletes. The choices underlying the guideline are explained in a separate document called 'Verantwoording en toelichting' (review of the evidence), which is available only in Dutch.

The recommendations for the treatment of ankle sprain have been adjusted on the basis of recent literature studies, which yielded stronger evidence for functional treatment (as opposed to immobilization) and for the effectiveness of exercise therapy for athletes to prevent recurrent ankle sprain. These studies have also yielded more evidence that the use of passive modalities like ultrasound, laser therapy or electrotherapy is not effective for the treatment of acute ankle sprains.

The present guideline no longer uses the term 'chronic ankle sprain', as the treatment of chronic complaints in this guideline specifically focuses on functional instability, and the recommendations for this problem are essentially unchanged. On the other hand, new research findings have been taken into account in formulating the recommendations adopted from the former guideline on chronic ankle sprain.

As regards acute ankle sprain, the present guideline can be regarded as a specification for physical therapists of the consensus statement on the diagnostics and treatment of acute ankle sprain, which was developed by a committee of medical specialists, family physicians, and physical therapists under the auspices of the Dutch Institute for Health Care Improvement

(CBO, 1999). By and large, the guideline follows those on ankle distortion developed by the Dutch College of General Practitioners (NHG, 2000).

Figure 1 clarifies the interrelations and differentiation between acute ankle sprain and functional instability (see also the 'Verantwoording en toelichting' document, section A.3).

Acute ankle sprain

In this guideline, the term 'acute ankle sprain' refers to an inversion injury which is examined and treated within 6 weeks after it arises. The sports-specific rehabilitation for top-level athletes may cover a maximum of about 12 weeks after the injury arises. Ideally, patients should see a physical therapist between 0 and 5 days after the injury arises (the acute phase). The physical therapist should examine what phase of tissue recovery the patient is in, to assess whether the patient is showing a normal or abnormal recovery process. This assessment then determines the indication and management.

A 'normal' recovery process should result in functional recovery and cure without residual complaints (such as functional instability). Most patients will have resumed their sports activities at the same level as before the trauma within 12 weeks, and will normally be able to walk again within one to two weeks. If this is not the case, patients should be assessed to identify impediments, which in the case of inversion trauma may include:

- relevant concomitant pathology impeding 'normal' recovery (such as arthrosis);
- an 'out-of-control' inflammatory response;

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- unexplained pain that the patient is unable to control in any way;
- inadequate adjustment of the patient's behavior in terms of posture and movement (relative or absolute overload);
- being afraid to put weight on the ankle;
- re-injury; and/or
- pre-existent instability of the ankle.

Functional instability

Functional instability is defined as the persistence of residual symptoms after an inversion injury, in the form of a feeling of 'giving way' or recurrent spraining. Patients may feel anxious about putting their full weight (or indeed any weight) on the injured ankle, and prolonged load-bearing may cause pain. Complaints after prolonged load-bearing may include pain, swelling, and stiffness of the joint. Symptoms such as acute pain and swelling are less prominent; insofar as they are present, they relate to overload or actual recurrent spraining.

Functional instability may lead to undesirable behavioral adjustments, abnormal gait, avoiding everyday activities or to problems with certain professional or sports activities at the preferred level. Factors that may affect the development and/or persistence of functional instability include:

- mechanical instability (laxity of the capsular ligamentous complex);
- abnormal proprioception;
- reduced muscular strength;
- slow muscle reaction time;
- chronic synovitis;
- reduced dorsal flexion;
- inadequate coping with complaints; and
- anxiety and insecurity about the stability of the ankle.

Differential diagnostics

Differential diagnostics aim to establish the most likely diagnosis and exclude other injuries than those of the lateral capsular ligamentous complex. The primary aim is to exclude fractures, while the secondary aim is to detect any syndesmotric ruptures, medial ligamentous rupture, and the common cartilage injuries. Cartilage lesions may be accompanied by traumatic arthritis. Patients with cartilage injuries should not put too much weight on the ankle during the first week after the injury developed.

These diagnoses require sophisticated techniques, and any suspicion of more extensive lesions than just those to the lateral capsular ligamentous complex is an indication for further diagnostics, preferably after consulting the patient's family physician. In such cases, the treatment strategy and interventions may deviate from those recommended in the present guideline.

Syndesmotric ruptures impede the recovery process and have consequences for the treatment program. Apart from functional instability, residual complaints after acute ankle sprain may also arise from distal tibiofibular syndesmotric rupture; chondral or osteochondral lesions, and osteophytes (with or without impingement); soft tissue impingement; scar tissue; loose bodies or osteochondritis dissecans; subtalar (mechanical) instability; sinus tarsi

syndrome; or arthrosis (See also table 2 and the 'Verantwoording en toelichting' document, section B.1).

Epidemiological data

Annually, about 600,000 people in the Netherlands suffer a traumatic ankle sprain. More than half of acute ankle sprains arise from sports-related activities. The second national survey of illnesses and interventions in family practice showed that all Dutch family physicians together see an average of 210,000 patients with ankle sprains a year. No recent figures are available for referrals to physical therapists; figures for 1995 show that about 25% of patients were referred to a physical therapist.

Target group

This guideline is intended for physical therapists working in primary and secondary care settings. Correct implementation of the guideline requires competence in bandaging and taping. The therapists should be familiar with the recovery process and its various phases, with normal and abnormal gait, and with the principles of suitable buildup of load-bearing and exercise training, and should be able to work according to these principles.

Physical therapists and sports physical therapists

Sports-specific rehabilitation may require the special competencies of a sports physical therapist. The Dutch national committee on sports healthcare (Landelijk Platform Sportgezondheidszorg; LPS) distinguishes five target groups: chronically ill people, inactive people, recreational athletes, achievement-oriented athletes, and top-level athletes. The committee also distinguishes various types of intervention goals: prevention, cure (i.e. diagnostics and treatment), rehabilitation (regaining the level needed for one's sport), and reintegration (preparing athletes for competition). The present guideline does not relate to the first two target groups (chronically ill and inactive persons), nor to the reintegration phase. It classifies athletes according to the LPS classification system (see Table 1).

As a general rule:

- Recreational athletes can be diagnosed and treated by a general physical therapist.
- Disorders that have developed gradually as a result of prolonged sports-related activities should preferably be diagnosed and treated by a sports physical therapist.
- Achievement-oriented athletes can be diagnosed and treated by a sports physical therapist if specialized healthcare is available for their specific sport.
- Diagnostics, treatment, and rehabilitation of top-level athletes generally require the specific competencies of a sports physical therapist.

The guideline development committee recommends this classification to promote collaboration between various physical therapists and referrals from general therapists to sports therapists and vice versa. The committee feels that it is a normal and essential part of a physical therapist's professional attitude that they are aware of the limits of their own competence and deal with these limits in a responsible manner, for instance by timely referral to colleagues.

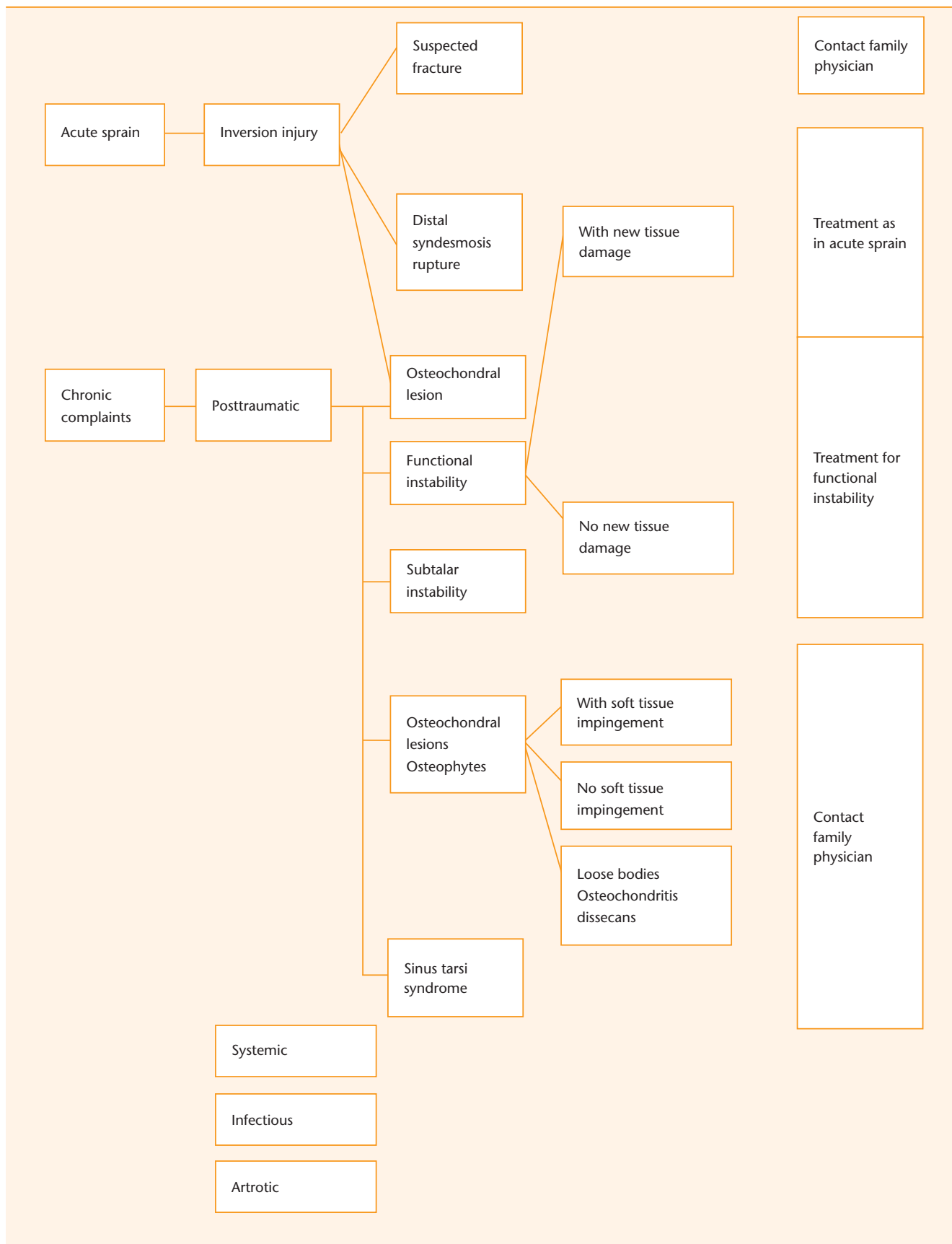


Figure 1. Interrelations and differentiation between health problems relating to acute ankle sprain and functional instability.

I Screening process

In view of the recent availability of direct access to physical therapy in the Netherlands, the systematic approach described in this guideline also includes screening. The screening process involves four components: presentation, identifying the problem, screening for pathology that requires medical attention ('sense of alarm'), and informing the patient of the results of the screening and giving them advice. The therapist should use specific questions and tests or other diagnostic procedures to decide, within a limited period of time, whether the patient exhibits a pattern of signs and symptoms that is compatible with his or her area of competence. An important aspect of screening for possible pathology requiring medical attention ('sense of alarm') is the use of differential diagnostics to identify 'red flags' and exclude serious injury.

I.I Presentation

Patients can present to a physical therapist on their own initiative (direct access) or after referral by a family physician or medical specialist. Direct access to physical therapists was made possible in the Netherlands by new legislation that came into force on 1 January 2006. Therapists collaborate with family physicians and specialists by means of reciprocal referrals, after consultation with and consent from the patient. If the necessary patient data are not available, the therapist should contact the family physician or the relevant specialist. If a patient presents without being referred, the therapist should initiate the screening process, after having identified the problem. If the patient was referred, no new screening is required. Nevertheless, therapists should continue to watch out, throughout the diagnostic and therapeutic process, for signs and symptoms that might require contacting the referring doctor.

I.II Problem identification

The aim of this stage is to determine the main complaints, their development, and the patient's goals.

I.III Screening for pathology requiring medical attention

The physical therapist should assess whether the patient's signs and symptoms are alarming or reassuring, based on their age, sex, and the available data on incidence and prevalence and the

development, symptoms, and signs, in order to decide whether further physical therapy examination is indicated. The therapist should focus on unfamiliar patterns, familiar patterns with one or more abnormal symptoms or abnormal development, as well as on 'red flags'.

Acute ankle sprain

The Guideline Committee recommends using the 'Ottawa ankle rules' to exclude possible fractures in patients with acute ankle sprain (see Section II.II).

Functional instability

In patients with functional instability, red flags include persistent synovitis and tenderness at the sinus tarsi. Persistent synovitis suggests osteochondral lesions, 'loose bodies' or impingement of soft tissues. Tenderness at the sinus tarsi suggests sinus tarsi syndrome.

I.IV Information and advice

At the end of the screening process, the physical therapist should inform the patient of the findings of the examination. If an unfamiliar pattern has been detected, or if one or more symptoms deviate from the pattern with which the individual physical therapist is familiar, if the pattern shows abnormal development or there are red flags present, the therapist should advise the patient to contact their family physician. If the findings do not indicate a possible problem requiring medical attention ('sense of reassurance'), the therapist should inform the patient about the options for further diagnostics.

II Diagnostic process

The aim of the diagnostic process in physical therapy is to use medical and other information to answer the question whether physical therapy could modify the causative and impeding factors that have led to the health problems reported by the patient and have been confirmed by the therapist. The diagnostic process should result in a physical therapy diagnosis. The therapist assesses the severity and prognosis of the injury to the capsular ligamentous complex by means of history-taking and examination.

Table 1. Characterization of types of athletes according to the Dutch national committee on sports healthcare (Landelijk Platform Sportgezondheidszorg; LPS).

Recreational athletes	These people regard sports activities as a way to relax. They exercise to stay healthy or to maintain regular social contacts. They are not primarily motivated by a desire to constantly improve their performance.
Achievement-oriented athletes	These athletes regard their sport as an exercise to constantly improve their performance, without trying to reach the limits of their abilities. They take part in competitive matches, though not necessarily as part of organized competition.
Top-level athletes	These athletes regard sport as a way to explore the extreme limits of physical (and mental) achievement. They are usually engaged in top-level sports at national or international level. Some of them are motivated by their desire to be 'the best of them all'.

II.I History-taking

Causative factors

- Has the patient suffered an inversion trauma?
- How did the trauma arise?
- Did the trauma arise from a high-velocity event (high-energy injury)?
- Where was/is the pain situated?
- Is it a recurrent injury? If so, how long ago was the previous injury, and how did the patient recover?

Development over time

- How long ago did the trauma arise?
- What measures did the patient take (icepack, compression, elevation, and rest)?
- What medical / therapeutic interventions have been applied and with what result?
- Did the pain arise immediately after the trauma?
- How did the pain develop?
- When did the swelling arise? Did it develop quickly or gradually?
- How did the swelling develop over time?
- How did the load-bearing capacity of the ankle develop over time?
- How did the functional recovery develop over time as regards ADL, (activities of daily living), professional, and sports activities?

Current complaints or present status

- Functional and anatomical characteristics:
 - Is the patient currently in pain during load-bearing, after load-bearing or at rest?
 - Is the load-bearing function of the foot currently reduced?
 - Is there any relevant concomitant pathology (other diseases or disorders)?
- Specific questions on functional instability:
 - Does the patient express a fear that the ankle will ‘give way’ or does the ankle actually sprain again?
 - If so, how many times a day do these problems occur and at what moments: during ADL, exertion or when the patient is tired?
 - Do complaints increase after such events?
 - If so, which complaints increase, during which activities, and how long do they last?
 - Is the patient using any external supports, such as tapes or braces?
 - At what moments, for what reasons, and how often does the patient use these supports?
- Activities:
 - To what extent is the patient able to put weight on their ankle during ADL, work or sport?
- Participation:
 - Has the patient been able to resume their activities in and around the house, their job, domestic activities, and sport at the same level as before the trauma?
- External factors:
 - Are there any external factors (such as the home or job situation) that might slow down recovery?

- Personal factors:
 - How is the patient coping with the complaints?

II.II Examination

Inspection

- Where is the pain situated?
- Is there any swelling? If so, where, to what extent, and what color is the skin?
- What is the patient's static posture like? Any stance abnormalities?

Differential diagnostics

Since acute ankle injuries may involve fractures, the Guideline Committee recommends applying the ‘Ottawa ankle rules’ for fracture diagnostics in the acute phase (up to 7 days after the trauma). According to these rules, X-ray examination of the ankle or mid-foot is indicated if the patient reports bony pain in the malleolar zone as well as:

- inability to put weight on the ankle (i.e. walk four 2x2 steps unassisted); or
- bone tenderness of the dorsal or caudal side of the lateral malleolus (distal 6 cm); or
- bone tenderness of the dorsal or caudal side of the medial malleolus (distal 6 cm); or
- bone tenderness of the base of the fifth metatarsal; or
- bone tenderness of the navicular bone.

Other findings suggesting mid-foot fractures include:

- axial pressure pain in the forefoot or heel;
- pressure pain along the fibula (so-called Maisonneuve fracture).

Minor avulsion fractures usually do not affect the management. If the patient is able to put weight on the ankle within 48 hours after the trauma, fracture is unlikely. This is a favorable sign for the severity of the injury and the recovery process. Figure 2 shows the Ottawa ankle rules.

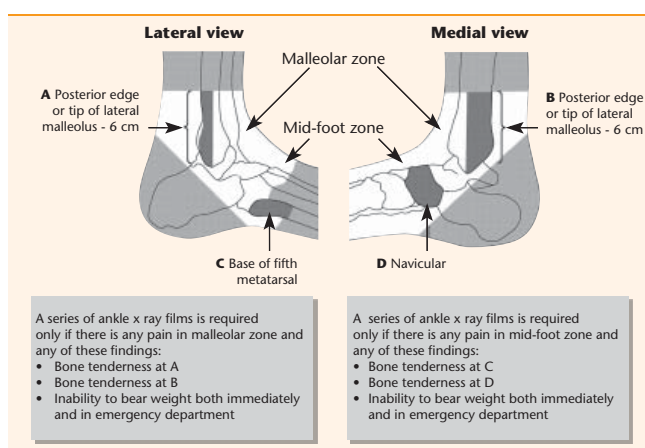


Figure 2. Ottawa ankle rules. Reprinted by permission from: Bachmann LM, Kolb E, Koller MT, Steurer J, Ter Riet G. Accuracy of Ottawa ankle rules to exclude fractures of the ankle and mid-foot: systematic review. *BMJ* 2003;326:417-23.

Table 2. Differential diagnostics for chronic ankle complaints.

Disorder	Definitions	Findings	Management
Distal tibiofibular syndesmosis rupture*	Ruptured distal anterior tibiofibular ligament due to inversion trauma or exorotational dorsal flexion trauma of the ankle with axial stress. Of the four ligaments stabilizing the distal tibiofibular syndesmosis, this is the one most frequently affected. Estimated incidence is 1% of all ankle sprains.	<ul style="list-style-type: none"> increased range of motion of the fibula persistent pressure pain along the ventral syndesmosis abnormal gait due to pain when putting weight on the ankle and upon dorsal flexion positive exorotation stress testa and squeeze testb Note: Findings in the acute phase correspond to those in ordinary inversion injury, but with little swelling(!). 	<ul style="list-style-type: none"> Early recognition is important since painless load-bearing capacity needs to be built up more gradually than in patients with normal inversion injury. Patient may require prolonged external support (tape/brace) in physically demanding situations. Otherwise, treat as recommended in this KNGF Ankle Sprain guideline. Recovery will take longer than for ordinary inversion injury.
(Osteo)chondral lesions and osteophytes with or without impingement**	Cartilage damage and uncontrolled formation of talar and tibial bone after a trauma (compression fracture) or due to arthrosis, possibly leading to bony (anteromedial or anterolateral) impingement.	<ul style="list-style-type: none"> stiffness functional limitations (dorsal and plantar flexion are restricted if there is ventral impingement) persistent swelling (synovitis) 	<ul style="list-style-type: none"> Refer patient to family physician if supplementary examinations (CT, MRI or arthroscopy) are indicated.
(Soft tissue) impingement scar tissue	Impingement of a capsule swollen by inflammatory response.	<ul style="list-style-type: none"> usually anterior pain and swelling impaired dorsal flexion moderate synovitis 	<ul style="list-style-type: none"> Refer patient to family physician if supplementary examination (arthroscopy) is indicated.
Loose bodies, osteochondritis dissecans**	Unattached stray fragment; see osteochondral lesions and osteophytes.	<ul style="list-style-type: none"> intermittent pain swelling clicking moderate synovitis 	<ul style="list-style-type: none"> Refer patient to family physician if supplementary examination (arthroscopy) is indicated.
Subtalar (mechanical) instability**	An estimated 10% of patients with functional instability show subtalar (mechanical) instability. So far, there is no decisive evidence of any difference in subtalar range of motion between symptomatic and asymptomatic feet.	<ul style="list-style-type: none"> difficult to establish reliable diagnosis local pressure pain on subtalar joint other findings as in functional instability 	<ul style="list-style-type: none"> Treat in same way as functional instability, as recommended in the present Guideline.
Sinus tarsi syndrome**	Swelling of the sinus tarsi (between talus and calcaneus) due to lesion of the interosseous ligament.	<ul style="list-style-type: none"> sense of 'giving-way' pressure pain 2 cm anterior and distal of the tip of the lateral malleolus (on sinus tarsi) 	<ul style="list-style-type: none"> Treatment consists of rest and NSAIDs's, in consultation with patient's family physician.
Arthrosis*	'Degenerative', non-inflammatory degeneration. The incidence of arthrosis of the ankle is low compared to that of arthrosis of the hip or knee. The incongruence between the articular surfaces is due to traumatic intra-articular damage. Note: see also osteophytes.	<ul style="list-style-type: none"> start-up pain and start-up stiffness activity-related pain sometimes complaints of instability dorsal flexion more painfully impaired than plantar flexion 	<ul style="list-style-type: none"> Enhance range of motion, especially that of dorsal flexion. Offer functional exercise therapy to improve gait and proprioception, as well muscle strength training. Recommend frequent low-load-bearing activities, like cycling. Recommend behavioral adjustments, such as short periods of activity alternating with rest. Recommend special footwear. If complaints persist, refer patient to family physician for alternative options (NSAIDs's, surgery).

* These complaints may also occur without any inversion trauma. The disorder can be accompanied by functional instability.

** Patient reports residual complaints after inversion trauma.

a Initial posture: patient is sitting with the knee in 90° of flexion and the ankle in neutral position. The physical therapist forces the foot into exorotation via the calcaneus, with the knee fixed on the lateral side. The test result is positive if the patient feels pain at the level of the syndesmosis.

b Using one or both hands, the physical therapist compresses the patient's leg between tibia and fibula, just above the middle of the lower leg. The test result is positive if this proximal pressure causes the patient to report pain at the level of the distal syndesmosis.

If the patient is unable to tense the muscles in their lower leg because of pain or because the muscle and / or tendon is ruptured, this suggests muscle and / or tendon injury.

Other findings suggesting more extensive injury include:

- hypermobility or hypomobility of the ankle;
- pain on the medial side ('kissing pain'/ osteochondral injury).

If a fracture, muscle or tendon injury or more extensive pathology is suspected, the patient should be sent back to the primary care physician or specialist who referred him or her, or the physician or specialist should be consulted (if the patient agrees). The physician can then initiate supplementary diagnostics and decide upon further management.

Table 2 lists the main symptoms and usual treatment for the above disorders, for the purpose of differential diagnostics. See also the 'Verantwoording en toelichting' document, Section B.1.

Functional testing

- Active movement tests: is the patient capable of active plantar and dorsal flexion of the foot?
- Passive movement tests: is passive dorsal flexion possible (with or without load-bearing)?
- How much weight can the foot bear?
- Does load-bearing result in pain, giving way, fear of movement or other symptoms?
- Can the patient stand on one leg with eyes open or shut?
- How does the balance response of the injured side compare with that of the unaffected side, during stance and while walking?

Acute ankle sprain

For the purpose of rehabilitation (whether or not sports-specific): does the patient have a ruptured anterior talofibular ligament? Distortions can be distinguished from ruptures with the help of delayed physical diagnostics (4-5 days after the trauma), by means of the anterior drawer test (see the 'Verantwoording en toelichting' document, Section C.2), assessing hematomatous discoloration and tenderness of the ligament on palpation.

Functional instability

- Assess the patient's gait.
- Can the patient stand still on one leg after jumping and landing on the affected leg?
- Can the patient walk on toes or heels?
- Is the patient capable of complex load-bearing activities including dual tasks?

II.III Measurement instruments

Measurement instruments are used to evaluate the patient's functional abilities as objectively as possible. Although various instruments are available, most have not been extensively tested for reliability and validity. This must obviously be kept in mind when using these instruments and interpreting their findings.

Function score

Determining a function score allows the physical therapist to

predict the duration of the recovery period in patients with acute or chronic ankle sprains. If a patient has a score of over 40 points at evaluation within five days after the trauma, the injury is regarded as mild. Such patients tend to walk reasonably well very soon. They usually have slight swelling and little pain during walking, and they can be expected to resume their normal everyday activities within 14 days. These slight injuries do not usually require specific physical therapy as long as recovery proceeds normally. Patients with more severe injury (≤ 40 points) do require specific treatment or monitoring. The interpretation of the various items in the function score is provided in Appendix 2.1.

Other measurement instruments to assess functions and/or skills include the Karlsson score, the Kaikkonen scale and the Ankle Joint Functional Assessment Tool (AJFAT).

Patient-specific complaints (PSCs)

The severity of the main complaints can be evaluated by means of the Patient-Specific Complaints instrument. The patient is asked to select three activities that they consider to be important and that cannot be avoided (for instance using stairs, running on grass, and getting out of a car). The patient is then asked to score the difficulties these activities cause them on three separate 100 mm Visual Analogue Scales (VAS) (see Appendix 2.2).

Nijmegen Gait Analysis Scale (GALN)

The Nijmegen Gait Analysis Scale can be used to describe and evaluate gait, by assessing the anatomical structures involved in gait: trunk, pelvis, hip, knee, and ankle. The instrument consists of 13 questions, each relating to a different aspect of gait (see Appendix 2.3).

II.IV Analysis

The main objective of the diagnostic process is to establish a physical therapy diagnosis and to assess whether there is an indication for physical therapy.

Acute ankle sprain

What is the recovery phase of the affected tissues and organs at examination?

Do the physical therapy findings correspond to a 'normal' recovery process?

- Does the duration of the complaints (i.e. the time since the trauma) correspond to the expected phase of a 'normal' recovery process?
- Has the course of recovery of the ankle sprain so far been 'normal', or is it abnormal (delayed recovery)?
- What is the prognosis (based on the Function Score) for recovery, in terms of the expected duration and the need for specific physical therapy or guidance?
- Should the patient be evaluated again in a week's time?

If recovery is abnormal, the following questions should be answered:

- Are local and adaptive conditions appropriate for growth and recovery?
- Are local conditions favorable for recovery, and can local factors that slow down the recovery process be influenced

by physical therapy?

- Are the general conditions favorable for recovery, and can general factors that slow down the recovery process be influenced by physical therapy?

Functional instability

Can the factors that have contributed to the ankle complaints be influenced by physical therapy?

What factors are promoting and impeding recovery?

What are the main abnormalities in terms of functional and anatomical characteristics and the main impairments and participation problems, and what are the links between them? How do these abnormalities, impairments, and participation problems relate to the personal and external factors?

II.V Conclusion

- Does the patient suffer from acute ankle sprain?
- Does the patient suffer from functional instability?
- What is the physical therapy diagnosis?
- Is physical therapy an appropriate treatment for the patient?
- Can the patient be treated in accordance with the guideline?

Acute ankle sprain

If the physical therapist has any doubts about the nature of the injury, they should contact the patient's family physician or refer the patient back to the referring physician, who can initiate further diagnostic workup and decide on the appropriate management.

Patients who have sustained a mild sprain (i.e. have a function score > 40 points at assessment within 5 days after the trauma) can normally expect to resume their normal everyday activities within 14 days. They do not need specific physical therapy after the initial consultation with the therapist, provided the further course of recovery is normal, although the therapist may deviate from this principle depending on the patient's individual objectives. If the therapist is uncertain about the severity of the sprain, the patient should be re-evaluated after a week. The patient should be advised to contact the physical therapist if the pain and swelling persist. Achievement-oriented athletes and top-level athletes with mild ankle sprain may be treated until full recovery in sports-specific rehabilitation.

Patients who have sustained a more severe sprain (i.e. have a function score ≤ 40 points) should be offered specific treatment or guidance. Physical therapy should take place once a week during the expected 6-week recovery process. Achievement-oriented and top-level athletes with a more severe sprain should be treated more frequently, and the sports-specific rehabilitation program may extend to about 12 weeks after the injury.

Functional instability

Patients with persistent functional instability who also show new tissue damage should initially be treated for their acute sprain. As soon as the patient is able to put full weight on the foot, shows 'normal' heel-to-toe movement, and the recent swelling has reduced, the therapist can concentrate on the functional

instability. Patients with persistent functional instability but without new tissue damage can be treated as indicated in the guideline.

After the above questions have been answered, therapist and patient should jointly decide upon the individual treatment goals and establish a treatment plan.

III Therapy

The therapeutic process starts with the formulation of the treatment plan on the basis of the physical therapy diagnosis. The process should focus on the problem for which the patient is consulting the therapist. The intended level of outcome should be adjusted to the patient's individual preferences.

The treatment plan comprises the treatment goals, the procedures, the treatment frequency, and the expected number of sessions.

The therapeutic process aims to optimize the patient's functions, activities, and participation. The goal for patients with acute ankle sprain is complete recovery, while the goal for patients with functional instability is to optimize functional recovery, which means that patients should recover as much of their functional skills and activities as possible and should regain the highest achievable or preferred level of participation. Preventing recurrence is a key treatment goal for both types of patient.

III.I Acute ankle sprain

III.I.I Goals

Whether goals are fully achieved depends on the presence of factors that impede a 'normal' recovery, as identified in the analysis. A 'normal' recovery process includes four phases of tissue recovery: the inflammatory phase, the proliferation phase, the early remodeling phase, and the late remodeling phase. The treatment stages discussed in the present guideline are linked to these four recovery phases (see Table 3).

If the findings show that the recovery process is not proceeding 'normally', the following questions need to be addressed at each of the phases:

- What may be causing the abnormality (e.g. 'unexplained pain', excessive inflammation, or a total inability to stand on the affected leg)?
- What factors are impeding a 'normal' recovery? Can these factors be influenced by physical therapy and can the patient be treated in accordance with the guideline?

The Guideline Committee wishes to emphasize that the structure of the recovery process, in terms of the four phases and their durations, is only a rough guide, as the phases overlap and actual recovery depends on patients' individual factors. The therapist may estimate which phase a patient is in from the time that has elapsed since the trauma arose and the clinical findings, but is unable to assess the actual tissue recovery status.

If the patient has been referred within five days after the injury was sustained, the therapist can decide upon the treatment on the basis of the function score:

- If the function score is 40 points or less and the patient is showing an abnormal recovery process, the frequency of treatment should be adjusted, that is, intensified.

- If the function score is over 40 points, the injury can be classified as mild.
 - If the course of recovery is normal, no specific physical therapy is usually required, except perhaps for taping the ankle and making an appointment for a check-up.
 - If the patient is in sports-specific rehabilitation, treatment may be required until the patient can rejoin the competition in their sport.

If the patient’s preferred load-bearing capacity is not appropriate for the load expected in their work, hobbies or exercise, the physical therapist should design a tailor-made program of treatment and training that is specifically designed to achieve the required level of activity, including that needed for specific sports. This type of guidance and treatment requires special expertise.

III.I.II Procedures

Phase 1: Inflammatory (0 to 3 days)

Treatment goals

Reducing pain and swelling, improving circulation and promoting partial load-bearing.

Procedures

- Information:
 - Provide information on the nature and severity of the capsular ligament injury and the expected normal course of recovery.
- Advice:
 - Advise the patient to rest and elevate the foot, and to apply a cold compress if they desire to do so (15 to 20 minutes, 1 to 3 times a day).
 - Advise the patient to put weight on the foot to the extent that the pain allows it, using elbow crutches if necessary.

- Advise the patient to avoid putting weight on the foot at work (by doing sedentary work and elevating the foot); if load-bearing cannot be avoided at work, they may have to take some time off work.
- Advise the patient to refrain from sports activities until further recovery has occurred.
- Exercising functions:
 - Have the patient move their foot and toes, as far as the pain allows, to stimulate the circulation.
- Bandaging:
 - Apply a compression bandage.
 - Instruct the patient so they can do this themselves.
- Tape/brace: in this phase, taping is generally not a good idea, because of the swelling. If the patient is in sports-specific rehabilitation, taping may be applied at an earlier stage, provided the tape can be replaced every day. The Guideline Committee recommends the use of an adhesive bandage underneath the tape.

Phase 2: Proliferation phase (4 to 10 days)

Treatment goals

Restoring functions and activities and building up load-bearing capacity.

Procedures

- Advice:
 - Advise the patient to walk to the extent that the pain allows it, using elbow crutches if necessary. Stimulate symmetrical weight-bearing and active heel-to-toe movement, while preventing an increase in inflammation symptoms like pain and swelling. After 4 to 10 days, a symmetrical gait should be possible.
 - Advise the patient to return to work as soon as they can walk with normal heel-to-toe movement, or after special measures have been taken to avoid too much load-bearing at work, in consultation with the patient’s employer.

Table 3. Phases of the ‘normal’ recovery process.

Phase	Tissue recovery	Time	Symptoms
Phase 1	Inflammation	0 to 3 days	Pain at rest Swelling and hematoma No full weight on ankle
Phase 2	Proliferation	4 to 10 days	Foot can be actively moved to neutral position Swelling reduced Putting weight on foot, no complete heel-to-toe movement Possible fear of movement
Phase 3	Early remodeling	11 to 21 days	Hematoma still present Normal heel-to-toe movement Pain and fear of movement during ADL
Phase 4 ^a	Late remodeling	3 to 6 weeks	No more hematoma Dorsal flexion possible
Phase 5 ^b		6 to 8 or 12 weeks	Pain and/or fear of movement during ADL or sports activities

^a transfer 1: preferred load-bearing capacity in ADL and at work.

^b transfer 2: preferred load-bearing capacity at high-level or top-level sports.

- Exercising functions and activities:
 - Exercises to improve the range of motion of the ankle (including dorsal flexion), active stability, coordination, and walking. Ensure functional load-bearing on the ankle during ADL.
 - Advise top-level athletes to use other types of training exercises to maintain their physical condition and/or muscle strength.
- Tape/brace:
 - Tape the injury as soon as the swelling has sufficiently subsided. The choice between taping and a brace depends on the patient's own preference. The Guideline Committee recommends retaping once a week.

Phase 3: Early remodeling phase (11 to 21 days)

Treatment goals

Improving muscle strength, active (functional) stability, range of motion of the ankle, and walking, running and using stairs.

Procedures

- Information:
 - Provide information on possible preventive measures (taping or using a brace) when resuming activities that expose the ankle to heavier stresses, such as high-risk work and/or sport.
 - Examine the patient's footwear (normal as well as sports footwear) to assess whether it is suitable for the relevant surface or sport; suggest changes if necessary.
- Exercising functions and activities:
 - Exercise to improve balance, muscle strength, range of motion of the ankle, and walking, running and using stairs. Try to establish a symmetrical gait.
 - Exercise to improve dynamic stability. As soon as the ankle can bear enough weight, start active load-bearing exercises, focusing on balance and coordination. Gradually raise the level of difficulty and loads (depending on functional stability and provided no new swelling occurs), from static to dynamic exercises, from partial load to full load, from simple exercises to functional exercises with dual tasks and exercises on various surfaces, as well as progressing from cyclical movements to non-cyclical (abrupt and irregular) movements.
 - Instructing the patient to exercise at home is an essential part of the treatment.
- Taping/brace:
 - Advise the patient to use tape or a brace during sports or other strenuous physical exertion. This should be continued until the patient is sufficiently able to do the static and dynamic balance and coordination exercises to promote functional stability.

Phase 4: Late remodeling phase (3 to 6 weeks)

Treatment goals

Increasing regional load-bearing capacity, walking, and stair-climbing abilities, and skills required for work, domestic, and sports-related activities.

Procedures

- Exercises and guidance on functions and activities:
 - Exercises to improve coordination for various skills (hopping, jumping, etc.).
 - Adjust the exercise plan to ultimately achieve normal loads, that is, the patient's usual loads before the trauma occurred, including those for exercising.
 - Ensure a gradual build-up of loads and progression from static to dynamic exercises and from simple to functional exercises with dual tasks and on various surfaces, as well as progressing from cyclical movements to non-cyclical (abrupt and irregular) movements, until normal loads are achieved.
 - Continue these exercises to promote coordination in various situations until the intended goals have been achieved.
 - Instructing the patient to exercise at home is an essential part of the treatment.

Phase 5: Transfer 2 (6 to 12 weeks)

Procedures

- Exercises and guidance on functions and activities for achievement-oriented and top-level athletes:
 - Continue treatment until the required load-bearing capacity has been achieved, in view of the high demands made on the load-bearing capacity of the ankle.
 - Design an individual treatment and training program adapted to the athlete's type of sport and their specific level.
 - It is important to include sufficient time for rest and recovery within and between training sessions (periodizing).

Requirements for sport-specific rehabilitation in this target group may be so specific that they require the competences of a specialized sports physical therapist.

III.II Functional instability of the ankle

III.II.I Goals

The physical therapy treatment aims to optimize functional recovery to achieve the greatest possible restoration of the patient's functions and activities and a return to the highest possible or preferred level of participation, as well as to prevent recurrence, exacerbations, and dysfunctionality.

Secondary goals of physical therapy include:

- teaching the patient to optimize the load-bearing 'dosage', that is, to adjust the loads to the load-bearing capacity of the ankle, and then to gradually increase the loads while continually monitoring how the ankle responds;
- recovering normal dynamic gait;
- recovering active stability:
 - by means of coordination and balance exercises;
 - by means of strength and endurance training;
- recovering the range of motion of the ankle.

Structure of physical therapy

The therapy should primarily aim at recovering normal gait and normal ankle functions as used during ADL.

After these two functions have been stabilized for ADL, the therapy can focus on activities at a higher ADL level (ADL plus: physically demanding work, hobbies and/or exercising). Activities should be progressively intensified, in line with increasing load-bearing capacity. Intensification can be achieved using exercises increasing in terms of:

- level of difficulty;
- loads;
- speed of movement;
- endurance;
- dynamics.

In the next stage, therapy can focus on specific skills required for:

- physically demanding work (e.g. lifting heavy loads);
- strenuous ADL (using stairs);
- sports (running, jumping, specific training activities).

The exercises and/or training activities should be adapted to the specific demands made upon the ankle. If the patient wishes to resume sports activities, exercises should cover all load-bearing aspects of their specific sport(s). This means that the therapist should analyze the specific requirements for a particular patient engaging in a particular sport. Exercises should gradually work up to the level at which the patient would like their ankle to function, insofar as this is feasible.

III.II.II Procedures

Information and advice

- Inform the patient about the rate of recovery that they can expect. If you expect that full recovery will not be possible, you should discuss this with the patient. Together with the patient, set specific goals that are achievable, in terms of functions as well as activities and participation. Try to set specific times for achieving the overall and subsidiary goals (time-contingent strategy), if the load-bearing capacity of the ankle allows this.
- Instruct the patient how to adjust the load to the load-bearing capacity of the ankle during ADL and increase the loads while monitoring the response of the joint. Explain that pain, swelling, stiffness, and loss of function may indicate overloading (for instance because loads were increased too rapidly).
- If preferred, you can advise the patient to use tape, bandage or a brace if they experience complaints or have to engage in activities involving causative movements (for instance when returning to work). It is essential to advise the patient about a balanced use of tape, bandage or brace use.
- Discuss the importance of exercising at home, and emphasize the importance of a correct gait during everyday activities, including correct stance, correct heel-to-toe movement, etc.

Exercising functions and activities

- Gait: try to achieve a symmetrical and dynamic gait to prevent complaints persisting due to the patient's own habits. Exercise to improve everyday activities such as standing up and sitting down, using stairs, etc.

- Coordination and balance:
 - Use exercises to improve static balance at increasing level of difficulty (for instance with eyes open or shut, on a large or small supporting platform, on stable or unstable surface, on a sufficiently high wobble board (> 30° of supination), with or without external disturbing factors, etc.). Additionally, use progressive exercises to improve dynamic balance (for instance going from simple exercises to functional exercises with complex dual tasks on a variety of surfaces). Dual tasks during balance exercises could include mental tasks (such as mental arithmetic).
 - Exercises should progress from cyclical movements to non-cyclical (abrupt and irregular) movements.
 - If necessary, use proprioceptive taping (for instance two stirrups around the unstable ankle) to allow the patient to consciously perceive the position and movements of the ankle.
- Strength and endurance:
 - Strength and endurance training should include local strength exercises. The exercises should also be done in functional situations. Both strength exercises and functional exercises should include muscular endurance.
 - It is important to include sufficient time for rest and recovery within and between training sessions.
- Speed:
 - The speed of movements used in exercising functions and skills should be gradually increased.
 - Exercises should progress from cyclical movements to non-cyclical (abrupt and irregular) movements.
- Range of motion:
 - Any increase in the active or passive range of motion of the ankle (dorsal flexion) should immediately be followed by exercises to improve proprioception and stability, in order to reinforce stability in the newly acquired range of motion.
- Taping, bandaging or brace:
 - If patients frequently feel the ankle 'giving way', advise them to tape the ankle or use a brace during the period in which the load is being increased.
 - Advise patients to tape the ankle or use a brace when putting extra weight on the ankle, for instance when resuming high-risk work and/or exercising. As soon as good muscular stability has been achieved and the patient can perform the functional exercises satisfactorily, external support should preferably be reduced.

High loads, e.g. in sports

If the patient's ankle is subject to unusually high loads, as in achievement-oriented or top-level athletes, sports-specific rehabilitation may be continued until the necessary load-bearing capacity has been achieved. Requirements may be so specific that they require the competences of a specialized sports physical therapist.

III.II.III Evaluation

The therapist can assess whether patients are ready for higher loads by means of the two measurement instruments described above (PSC and GALN), and by evaluating the patient's functional abnormalities and their severity. Overloading (for instance

because the loads have been increased to rapidly) is indicated by the presence of pain and/or swelling and/or loss of function and/or decreasing quality of movement in response to exercises or to increased load-bearing during everyday activities.

The results of the physical therapy should be evaluated after three, six, and possibly also after nine and twelve weeks. The scores on the measurement instruments at these evaluations should show an increase relative to the baseline values or to those obtained at a previous evaluation. Such progress may be subjective (patient-specific complaints, pain, sense of 'giving way', and ADL skills) or objective (gait, strength, coordination, endurance, and load-bearing capacity). Positive effects should be evident after six weeks, for instance improvements in patient-specific complaints (PSC) as reported by the patient and gait improvements when the patient consciously tries to walk with a correct gait. If no improvements are found, the patient should (if he or she agrees) be referred to their family physician.

III.III Preventing ankle injuries

Certain measures have proved to reduce the risk of recurrent inversion trauma, and can be recommended to the patient by the physical therapist in the form of advice and instructions:

Advise the patient not to use a brace or taping as a standard precaution during training and other sports activities, but to use such devices during actual competitive games (especially in high-risk sports like indoor and contact sports). This not only reduces the risk of relapse but also reduces the severity of any re-injuries.

Advise the patient to buy new footwear regularly as it wears out. High-top sports shoes do not offer better protection than low-top ones.

Advise and instruct the patient to continue proprioceptive training, in addition to the specific training for their sport, after the therapy has been completed (offer explanation and instructions how to do this at home).

III.IV Concluding the treatment and reporting

There is a special KNGF guideline on physical therapy reporting (only in Dutch), which describes how the treatment should be concluded and what records the therapist should keep about the treatment. After the therapy has been concluded, the physical therapist should report to the patient's family physician, in accordance with the KNGF guideline on informing the family physician (in Dutch).

Supplements

Supplement 1 Conclusions and recommendations

Review of the evidence

The strength of the evidence for the recommendations, based on the literature, is rated in accordance with national agreements (by the Evidence-Based Guidelines Platform EBRO and the Dutch Institute for Healthcare Improvement CBO). We distinguish four levels of evidence, based on the quality of the underlying research papers:

- 1 one systematic review (A1 quality; see below) or at least two independent studies of A2 quality;
- 2 at least two independent studies of B quality;
- 3 one study of A2 or B quality, or several studies of C quality;
- 4 expert opinion, e.g. that of members of the Guideline Committee.

Quality levels (intervention and prevention)

- A1 Systematic reviews including at least some studies of A2 quality, with results consistent across individual studies.
- A2 Randomized comparative clinical trial (RCT) of sound methodological quality (randomized double-blind controlled trial) of sufficient size and consistency.
- B Randomized comparative clinical trial (RCT) of moderate quality or insufficient size; other comparative study (non-randomized comparative cohort study or case-control study).
- C Non-comparative study.
- D Expert opinion, e.g. that of members of the Guideline Committee.

Screening

1 Differential diagnostics for fractures (level 1)

The Ottawa ankle rules are an accurate instrument to exclude fractures within a week after the ankle sprain was sustained. Quality of articles: A1 (Bachmann et al., 2003¹).

Diagnostic process

2 Passive tests (level 4)

In the opinion of the Committee, passive (stress) tests generally do not offer any added value for the establishment of a physical therapy diagnosis in patients with ankle sprain.

3 Passive tests (level 3)

There are indications that the (delayed) anterior drawer test can provide supplementary information about the mechanical instability of the ankle.

Quality of articles: A2 (Van Dijk, 1994²).

4 Passive tests (level 4)

In the opinion of the Committee, the use of the (delayed) anterior drawer test is only indicated for achievement-driven and top-level athletes, to support the rehabilitation process and the expected return to competition or top-level sporting activities.

5 Use of the Function Score (level 3)

In the opinion of the Committee, the use of the (delayed) anterior drawer test is only indicated for achievement-driven and top-level athletes, to support the rehabilitation process and the expected return to competition or top-level sporting activities.

Quality of articles: B (De Bie et al., 1997³).

Therapy

6 Icepacks (level 3)

There are indications that the use of icepacks is not an effective method to reduce swelling and pain in acute ankle sprain. Quality of articles: B (Bleakley et al., 2004⁴).

- 7 Icepacks, compression and elevation (level 4)**
In the opinion of the Committee, the use of icepacks and compression, combined with rest and elevation (RICE), is useful in the acute phase, to enhance the patient's sense of well-being.
- 8 Functional treatment (level 1)**
It has been demonstrated that functional treatment using elastic bandages, braces or taping is more effective than immobilization.
Quality of articles: A1 (Kerkhoffs et al., 2002⁵).
- 9 Functional treatment (level 2)**
It is unclear whether bandaging, taping or braces form the most effective functional treatment of acute ankle sprain.
Quality of articles: A1 (Kerkhoffs et al., 2002⁶).
- 10 Functional treatment (level 4)**
In the opinion of the Committee, elastic bandaging is the preferred treatment in the acute phase (0 to 5 days), in view of the presence of swelling.
- 11 Functional treatment (level 4)**
In the opinion of the Committee, the choice between taping and using a brace in the rehabilitation process after the acute phase of an inversion trauma depends on the patient's own preference.
If the patient is an athlete who is being intensively assisted to resume top-level sports activities, taping can be applied even in the acute phase, provided the tape can be changed every day. The Committee recommends the use of an adhesive bandage underneath the tape.
- 12 Exercise therapy after acute ankle sprain (level 4)**
In the opinion of the Committee, exercise therapy should be part of the treatment of severe acute ankle sprains, or in situations of unusual load-bearing (e.g. for athletes).
- 13 Exercise program for functional instability (level 3)**
There are indications that the treatment of functional instability of the ankle, in order to optimize ankle function, should primarily consist of an exercise program that is as varied and intensive as possible.
Quality of articles: C (Bahr et al., 1997⁷; Heidt et al., 2000⁸; Holme et al., 1999⁹ and Söderman et al., 1991¹⁰).
- 14 Proprioception (level 2)**
It is plausible that exercises to improve coordination and balance can prevent recurrent ankle sprain among athletes.
Quality of articles: B (Stomp et al., 2005¹¹; Van der Wees et al., 2006¹² and Verhagen et al., 2000¹³).
- 15 Proprioception (level 2)**
It is plausible that exercises to improve coordination do not improve postural sway.
Quality of articles: B (Van der Wees et al., 2006¹²).
- 16 Proprioception (level 4)**
In the opinion of the Committee, wobble board exercises alone are insufficient to train all aspects of proprioception. The Committee recommends using functional (ADL) or sport-specific types of exercise as much as possible. In the opinion of the Committee, proprioception should be trained across the full range of motion, so as to activate the mechanoreceptors under specific angles as well. This is particularly relevant to the range of motion regained after mobilization.
- 17 Proprioception (level 4)**
In the opinion of the Committee, proprioception training is valuable for athletes who have sustained an acute ankle sprain, in order to prevent recurrence. The physical therapist can advise the patient and their trainer to integrate proprioception exercises into regular training and other sports-related activities.
- 18 Muscle strength (level 3)**
There are indications that strength training promotes the recovery in cases of functional instability of the ankle.
Quality of articles: C (Blackburn et al., 2000¹⁴; Kannus et al., 1992¹⁵; Tropp et al., 1985¹⁶; Uh et al., 2000¹⁷ and Wojtys et al., 1996¹⁸).

- 19 Muscle strength (level 4)**
In the opinion of the Committee, the exercise program should be sufficiently intensive, and include enough repetition, to train muscle endurance as well.
- 20 Range of motion (level 2)**
It is plausible that manual range-of-motion exercises initially have a positive impact on dorsal flexion of the ankle after acute or subacute injury.
Quality of articles: A2 (Van der Wees et al., 2006¹²).
- 21 Range of motion (level 4)**
In the opinion of the Committee, the therapist should attempt to actively restore range of motion. If this has insufficient effect, passive techniques can be used as a supplementary treatment.
- 22 Range of motion (level 4)**
In the opinion of the Committee, mobilization of dorsal flexion can be useful for top-level athletes with mild acute ankle injuries, to help them rapidly regain competition level.
- 23 Passive modalities (level 1)**
There is no conclusive evidence that ultrasound, laser therapy and electrotherapy are effective methods to treat acute ankle sprains.
Quality of articles: A1 (Gezondheidsraad, 1999¹⁹ and Van der Windt et al., 2001²⁰).
- 24 Passive modalities (level 2)**
It is plausible that the use of short-wave therapy is not an effective method to treat acute ankle sprain.
Quality of articles: B (Barker et al., 1985²¹; Micklovitz et al., 1988²²; Pasila et al., 1987²³; Pennington et al., 1993²⁴ and Wilson, 1972²⁵).
- 25 Passive modalities (level 4)**
In the opinion of the Committee, the use of passive modalities generally offers no added value to the treatment of functional instability of the ankle.

Prevention

- 26 Tape and brace (level 1)**
It has been demonstrated that the use of taping or braces reduces the risk of ankle sprain in high-risk sports. If a patient has already sustained an ankle sprain before, the use of taping or braces reduces the re-injury risk and the severity of any recurrent injury.
Quality of articles: A1 (Handoll et al., 2001²⁶; Stomp et al., 2005¹¹ and Verhagen et al., 2000¹³).
- 27 Tape and brace (level 4)**
In the opinion of the Committee, routine use of taping or braces during sports or other physically demanding activities can in the long run have a negative impact on functional stability. In the Committee's opinion, regaining functional stability should be the final goal of treatment. The Committee recommends that therapists should try to get their patients to gradually reduce the use of external supports.
In the opinion of the Committee, routine use of taping or braces should only be used by top-level athletes during actual matches.
- 28 Footwear (level 4)**
In the opinion of the Committee, it is important to adapt the patient's footwear to the prevailing circumstances, including ADL, work and exercising, and to the type of surface. The Committee also recommends replacing worn-out footwear regularly.

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Supplement 2 Measurement instruments

Appendix 2.1 Function Score by De Bie et al.

De Bie et al. (1997) used the Function Score as a prognostic instrument to distinguish between mild and severe sprains.

The function score should be assessed by a physical therapist. If patients have a score of over 40 points at the first examination

within 5 days after the trauma, they can expect to be able to resume their normal everyday activities within 14 days. Such patients (i.e. those with a mild sprain) recover a reasonable gait very soon.

Items of the Function Score by De Bie et al.

Item	Complaint	Score
Pain	no pain	35
	pain during or after exercise	30
	pain when running on uneven surface	25
	pain when running on even surface / non-athletes	20
	pain when walking on uneven surface	15
	pain when walking on even surface	10
	pain when putting weight on affected foot	5
	constant pain when at rest	0
Dynamic stability	no tendency to sprain	25
	occasional tendency to sprain	20
	frequent tendency to sprain during exercise / non-athletes	15
	occasional tendency to sprain during ADL	10
	frequent tendency to sprain during ADL	5
	tendency to sprain at every step	0
Load-bearing capacity	patient can hop on one leg	20
	patient can stand on toes of one leg	15
	patient can stand on one leg with full weight	10
	patient can stand on both legs with partial load on both legs	5
	no loading is possible	0
Swelling	no swelling	10
	slight swelling	6
	moderate swelling	3
	severe swelling	0
Gait	patient is able to run	10
	patient can walk with correct gait	6
	patient walks with slight limp	3
	patient walks with severe limp	0
Total		100

Interpretation

Pain

- If the patient is not in constant pain, but puts no weight on the affected foot, they are allocated 5 points.
- If the patient feels no pain when walking on an even surface, but is not yet walking (or is afraid to walk) on uneven surfaces, they are allocated 15 points.
- If the patient feels no pain when walking, but is not yet jogging (or is afraid to jog), they are allocated 20 points.
- Non-athletes who no longer feel any pain during walking are allocated 20 points.
- If the patient can jog on even surfaces without pain, but not yet on uneven surfaces, they are allocated 25 points.
- If the patient can jog on uneven surfaces without pain, but is not yet able to engage in high-level exercising, they are allocated 30 points.

Dynamic stability

- If the ankle remains stable during walking, but the patient is not jogging yet (is afraid to jog), they are allocated 15 points.
- Frequent tendency for the ankle to sprain means that this occurs on a daily basis.
- Non-athletes whose ankle does not show a tendency to sprain during ADL are allocated 15 points.

Load-bearing capacity

- The patient should be asked to actually execute the relevant movement to determine the load-bearing capacity.

Swelling

Swelling is assessed on the basis of the following criteria:

- slight swelling: visible difference between left and right ankles;
- moderate swelling: clearly visible difference between left and right ankles; lateral malleolus can still be distinguished;
- severe swelling: very obvious difference between left and right ankles; the space around the lateral malleolus is entirely swollen (i.e. the lateral malleolus is no longer distinguishable).

Gait

- 'Severe limp' is always recorded if the patient shows no active heel-to-toe movement; i.e. the heel of the affected leg does not leave the ground at the end of the stance phase.
- 'Slight limp' is recorded if there is heel-to-toe movement, but less than 'normal'.
- Walking speed should preferably correspond to a step frequency of between 110 and 120 steps a minute.

Scoring table for the Function Score: maximum score for non-athletes is 75 points.

Item	Score
Pain	20
Stability	15
Load-bearing capacity	20
Swelling	10
Gait	10
Total	75

Appendix 2.2 Patient-specific Complaints (PSC)

The Patient-Specific Complaints instrument can be used to assess the severity of a patient’s main complaints. The patient is first asked to select three complaints relating to activities that the patient considers important and that cannot be avoided (for instance using stairs, running on grass and getting out of a car). The patient is then asked to score these three activities on three separate 100 mm Visual Analog Scales (VAS).

- Ask the patient to mention the three most difficult, most important and most frequent activities or movements that they feel are impaired as a result of their ankle problems. These have to be activities and/or movements that the patients considers important and that they cannot avoid.
- Ask the patient to describe these three activities as precisely as possible. Try to quantify the movements as much as possible, in terms of duration, distance, repetitions, etc.
- Ask the patient to indicate on three Visual Analog Scales how much difficulty they experience when performing each of these three activities. This should be asked during the history-taking or at the start of the treatment, as well as at relevant evaluations (for instance after 3 and 6 weeks).
- The effect of the therapy can be evaluated on the basis of the three VAS scores. The effect is always expressed as the difference between the first and second measurements. For instance, if the first measurement results in a score of 70 mm (distance from the left end of the VAS scale) and the second in a score of 30 mm, the effect score is 40 mm. Note: the length of the VAS scale is exactly 100 mm.

The following three complaints (frequent activities that are hard to do) are mentioned, in order of importance:

1.
2.
3.

Invulvoorbeeld

Problem: walking for 30 minutes.

In the past week, how difficult was it for you to do this?

The further to the left you place your line, the less difficult it is for you to walk for 30 minutes.



The further to the right you place your line, the more difficult it is for you to walk.



Date:

Problem 1:

In the past week, how difficult was it for you to do this?

not difficult at all _____ impossible

Problem 2:

In the past week, how difficult was it for you to do this?

not difficult at all _____ impossible

Problem 3:

In the past week, how difficult was it for you to do this?

not difficult at all _____ impossible

Appendix 2.3 Nijmegen Gait Analysis Chart
 Department of Physical Therapy CSS, Radboud
 University Medical Centre, Nijmegen, The Netherlands



Name:

Date: / /

Assessed by:

Affected side: left (...) right (...)

Step frequency: steps per minute

	Item	Question		STANCE PHASE			SWING PHASE	
				Early	Mid	Late	Early	Late
General	1	Is a shortened stance phase present?	Left	Yes / No				
			Right	Yes / No				
Trunk	2	Is the trunk anterior to the hips?	Yes / No					
	3	Is the trunk posterior to the hips?	Yes / No					
	4	Is lateral flexion present?	Left	Yes / No				
			Right	Yes / No				
	5	Is arm-swing reduced?	Left	Yes / No				
Right			Yes / No					
Pelvis	6	Is the posterior rotation excessive?	Left			Yes / No		
			Right			Yes / No		
Hip	7	Is the extension reduced?	Left			Yes / No		
			Right			Yes / No		
Knee	8	Is the extension reduced?	Left				Yes / No	
			Right				Yes / No	
	9	Is the flexion movement absent?	Left	Yes / No				
			Right	Yes / No				
	10	Is the flexion reduced?	Left	Yes / No				
			Right	Yes / No				
11	Is the extension absent?	Left			Yes / No			
		Right			Yes / No			
Ankle	12	Is the plantar flexion reduced?	Left			Yes / No		
			Right			Yes / No		
	13*	Is dorsal flexion reduced?*	Left			Yes / No	Yes / No	
			Rechts			Yes / No	Yes / No	

* Included in this guideline by permission of the authors.

Explanation

- Circle (yes) at the corresponding item on the form if you observe the particular disturbance.
- Circle (no) at the corresponding item on the form if you do not observe the particular disturbance.

Summary of range of motion in the sagittal plane, measured in degrees.¹

Phase of the gait	Stance phase		Swing phase		
	Early	Mid	Late	Early	Late
	0-10% GC	10-30% GC	30-60% GC	60-70% GC	70-100% GC
Trunk	Positioned over hip			Positioned over hip	
Pelvis	5° forward rotation	0°	5° backward rotation	5° backward rotation	5° backward rotation
Hip	25° flexion	0° 10° extension 50-60% GC: 0°	30-50% GC:	15° flexion	25° flexion
Knee	20° flexion	0°	40° flexion	60° flexion	0°
Ankle	10° PF	10° DF	20° PF	10° PF	0°

GC: gait cycle; PF: = plantar flexion; DF: dorsal flexion

Brief instructions for use

- Only clear gait disturbances are assessed.
- Scoring options: L (left), R (right), L + R (left and right) or O (normal).
- The minimum speed is 100 steps per minute.
- The analysis should preferably be based on video recordings that allow ‘freeze frame’.

The specific characteristics of dynamic gait are:

- A step frequency of between 110 and 125 steps per minute.
- The knee flexes at the start of the stance phase.
- Heel rise takes place before heel contact is established in the contralateral leg.
- The trunk is positioned in front of or over the hips/feet.
- The arms show a relaxed alternating swing (as a result of trunk rotation).

It is important that observers agree about the above, since normal gait can be subdivided into:

- a more static gait; and
- a more passive gait.

Specific characteristics of a ‘more static’ gait are:

- Step frequencies of 100 to 125 steps per minute are possible.
- Movement of the knee at the start of the stance phase is not very dynamic, possibly leading to fixation in the final position in the early stance phase (0-10% of gait cycle).
- First contact with the ground is made with the entire foot.
- Heel rise often occurs late or not at all.
- The trunk is positioned behind the hips.
- Arm swings are reduced, but remain alternating. Not very relaxed.
- Range of motion of all joints may be reduced relative to normal values (see normal values above).

Specific characteristics of a ‘more passive’ gait are:

- Step frequencies are below 100 steps per minute.
- No knee flexion in the early stance phase. Extension or hyperextension is often observed.
- First contact with the ground is made with the entire foot.
- No active heel rise.
- The trunk is positioned behind the hips.
- Arms swings are reduced.
- The various joints show abnormal range of motion (see normal values above).

Literature

- 1 Brunnekreef JJ, van Uden CJ, van Moorsel SR, Kooloos JG. Reliability of videotaped observational gait analysis in patients with orthopedic impairments. *BMC Musculoskelet Disord* 2005 Mar;17;6(1):17.

Supplement 3 Glossary

ADL	Activities of daily living
AJFAT	Ankle Joint Functional Assessment Tool
CI	Confidence Interval
CBO	Kwaliteitsinstituut voor de Gezondheidszorg (Dutch Institute for Healthcare Improvement)
EBRO	Evidence Based Richtlijn Ontwikkeling (Dutch platform for evidence-based guideline development)
GALN	Ganganalyselijst Nijmegen (Nijmegen gait analysis scale)
LPS	Landelijk Platform Sportgezondheidszorg (Dutch national committee on sports healthcare)
NHG	Nederlands Huisartsen Genootschap (Dutch College of General Practitioners)
PSC	Patient-specific complaints
RCT	Randomized Controlled Trial
RICE	Rest, Ice, Compression, Elevation
ROM	Range of motion
RR	Relative Risk
SMD	Standardized Mean Difference

KNGF

Clinical Practice Guideline
for Physical Therapy in patients with acute ankle sprain

ISSN

1567-6137

KNGF Clinical Practice Guideline number

V-01/2006

Volume

English version, January 2009

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