



EUROPEAN BONE AND JOINT HEALTH STRATEGIES PROJECT

EUROPEAN ACTION TOWARDS BETTER MUSCULOSKELETAL HEALTH

A Public Health Strategy to Reduce the Burden of
Musculoskeletal Conditions

Turning Evidence into Everyday Practice



eular European League Against Rheumatism



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and Training

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Endorsement

Musculoskeletal conditions are common throughout Europe and their impact on individuals is pervasive. They have enormous socioeconomic impact. These recommendations have the potential to reduce this impact on both individuals across Europe and also on employers and the social and health care systems throughout Europe. Actions need to be taken at all levels to ensure their implementation.

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Executive Summary

Background

Musculoskeletal conditions are a major cause of morbidity throughout Europe and have a substantial influence on health and quality of life inflicting an enormous cost on health and social care systems. In Europe nearly one quarter of adults are affected by longstanding musculoskeletal problems that limit everyday activities. They affect all ages but become increasingly common with ageing and are the major cause of physical disability. With an increase in the number of older people throughout the world, along with changes in lifestyle, this burden will increase.

The *European Action Towards Better Musculoskeletal Health* has developed strategies to prevent musculoskeletal problems and conditions where possible, and to ensure that those people with musculoskeletal conditions enjoy a life with fair quality as independently as possible. In addition, recommendations are made for the implementation of these at the national, regional and local level. These strategies have the potential to reduce the future burden of musculoskeletal conditions in Europe. This action has been undertaken by a collaboration of the Bone and Joint Decade, EULAR, EFORT and IOF with experts from across Europe in the areas of rheumatology, orthopaedics, trauma, public health, health promotion and policy implementation. In addition the views of people with musculoskeletal conditions have been taken into account.

All aspects of musculoskeletal conditions, from prevention to rehabilitation, are considered with a specific focus on osteoarthritis, rheumatoid arthritis, back pain, osteoporosis, major limb trauma, and occupational and sports musculoskeletal injuries. Strategies that have common benefits for these conditions have been identified.

A number of interlinked tasks have been undertaken:

- identification of the impact on the individual and society of musculoskeletal conditions to demonstrate the need for action and identify priorities
- identification of determinants of the development or outcome of musculoskeletal conditions to identify those at most risk or risk factors that could be modified

- identification of effective interventions for the prevention, treatment and rehabilitation of the various conditions by expert systematic review of the evidence-base provided by systematic reviews and guidelines
- development and dissemination of strategies that apply these interventions
- recommendations for the implementation of these strategies at the national, regional and local level, identifying barriers and ways in which implementation can be facilitated
- recommendations for the evaluation of these strategies

Strategies have been developed that consider prevention in the whole population and in those at high risk, and treatment from the earliest stages to those with well established conditions. The recommendations also consider evidence of effectiveness in dealing with symptoms, most commonly pain, tissue damage, function, activities and participation. This is following the concepts of the WHO International Classification of Functioning, Disability and Health available at URL: <http://www3.who.int/icf/icfemplate.cfm>. Interventions recommended include lifestyle measures, and pharmacological, surgical and rehabilitative interventions. The recommendations are broadly based and are not given for specific interventions, as there is a lack of comparative data to enable such specific recommendations to be made.

Strategies have been developed which bring together the evidence-based interventions that have been identified for the different conditions. Such strategies are aimed at the whole population to prevent these conditions where possible; at those individuals at highest risk of developing these conditions; and also at those who already have these conditions to reduce the impact that they have upon them. The strategies look for commonality of recommendations that will maintain or improve musculoskeletal health whatever the underlying condition. In addition they combine what can be achieved from evidence-based interventions with what those with musculoskeletal conditions, their carers and representatives; and health care providers want to be achieved.

Strategies for the prevention and management of musculoskeletal conditions

Strategies for the whole population

To reduce the enormous impact on the quality of life of individuals and socio-economic impact on society related to musculoskeletal conditions, people at all ages should be encouraged to follow a healthy lifestyle and to avoid the specific risks related to musculoskeletal health.

This means:

- Physical activity to maintain physical fitness
- Maintaining an ideal weight
- A balanced diet that meets the recommended daily allowance for calcium and vitamin D
- The avoidance of smoking
- The balanced use of alcohol and avoidance of alcohol abuse
- The promotion of accident prevention programmes for the avoidance of musculoskeletal injuries
- Health promotion at the workplace and related to sports activities for the avoidance of abnormal and overuse of the musculoskeletal system
- Greater public and individual awareness of the problems that relate to the musculoskeletal system. Good quality information on what can be done to prevent or effectively manage the conditions and the need for early assessment

Strategies for the at risk population

To prevent the enormous impact on the quality of life of individuals and socio-economic impact on society related to musculoskeletal conditions, those at greatest risk must be identified and encouraged to take measures to reduce their risk. This should be on a background of being encouraged to follow a healthy lifestyle and to avoid the specific risks related to musculoskeletal diseases.

This requires a case finding approach for the different musculoskeletal conditions aimed at identifying those individuals who are most at risk of future problems related to musculoskeletal diseases and who will benefit from evidence-based interventions. The following case-finding approaches and interventions are recommended:

Condition	Case finding strategy	Intervention recommended
Osteoarthritis	Those deemed most at risk, who include people aged 50+ years, obesity, abnormal biomechanics (e.g. identify newborns at risk of hip dysplasia), a history of joint injury, intense sporting activities or certain occupations.	For the population deemed to be at risk, there should be programmes to promote the importance of avoiding obesity, a gain in physical fitness and access to both preventative surgical interventions and rehabilitation.
Rheumatoid arthritis	Those with early inflammatory arthritis should be identified and assessed as soon as possible, as many will progress to develop rheumatoid arthritis.	People with three or more persistently inflamed joints should be assessed expertly as soon as possible, at least within 6 weeks of onset of symptoms. If diagnosed as rheumatoid arthritis, early treatment is recommended.
Back pain	All adults should be considered at risk. Back pain is very common and it is not yet possible to identify those in the community at greater risk of developing back pain with sufficient sensitivity or specificity to make any recommendations. "Yellow flags" for persistence or recurrence need to be looked for.	There should be a strategy to encourage the population to change behaviour and beliefs about back pain and on the importance of undertaking moderate exercises several times per week.

Osteoporosis	Assessment of fracture probability should be performed using risk factor profiling (e.g. older people (>65 years); men and women with strong risk factors such as untreated hypogonadism, previous low trauma fracture, glucocorticoid therapy, BMI <19 kg/m ² , maternal history of hip fracture, excess alcohol and smoking) and, where indicated, bone density assessment.	For the at risk population education and lifestyle advice should be provided, together with the correction of calcium and vitamin D deficiency and risk factor modification where possible. Case-finding strategies should be implemented to identify individuals with a high fracture probability. Interventions should be initiated for those with a high fracture probability as outlined in the next 2 sections.
Major musculoskeletal injuries	The whole population should be considered at risk, particularly those participating in traffic, high-risk occupation or leisure activities.	Identification of risk factors Create safe communities by <ul style="list-style-type: none"> • removing external risks • modifying the environment (safe roads, work place etc.) • using correct equipment (safe vehicles, work tools, etc) • using protective equipment (safety belt, helmets, work place etc.) • education and training programs • obeying rules and regulations • maintaining physical fitness • avoiding drugs and alcohol • establishing fast and well-trained rescue chain
Occupational musculoskeletal injuries	The whole working population should be considered at risk, particularly those exposed to repetition, high force, awkward joint posture, direct pressure, vibration, prolonged constrained posture or psychological factors such as psychological demand, stress, etc.	Identification of occupational risk factors. Adaptation of work place and organisation. Participation in accident awareness and prevention campaigns. Multi-disciplinary approach to educate participants on: <ul style="list-style-type: none"> • the importance of physical and psychological • the skills and techniques required by the particular work • the nutritional requirements of the events • correct clothing and protective equipment • obeying the rules
Sports injuries	The whole population that participates in physical activity or sport is at risk, particularly the physically unfit person if they try to do too much, too quickly. Participants in contact sports, where the wrong body type for the sport, the level of expertise and experience differ and the rules of the sport are not observed. In the rehabilitation phase the risk for a new injury is increased.	Identification of risk factors. Multi-disciplinary approach to educate participants on: <ul style="list-style-type: none"> • the importance of physical fitness incl. basic aerobic fitness • the skills and techniques required by the particular sport • the nutritional requirements of the events • correct clothing and protective equipment • obeying the rules

Strategies for those with the early features of a musculoskeletal problem

To prevent the enormous impact on the quality of life of individuals and the socio-economic impact on society related to musculoskeletal conditions, those with earliest features of a musculoskeletal condition should receive an early and appropriate assessment of the cause of their problem. Once their needs have been identified they should receive early and appropriate management and education in the importance of self-management.

This requires methods to ensure that those who have the earliest features of the different musculoskeletal conditions are assessed by someone with the appropriate competency and that the person should have timely access to care that is appropriate to their needs.

The following approaches are recommended for early assessment and management to achieve the best outcomes. These are on a background of

- enabling people to recognise the early features of musculoskeletal conditions and to know what to do, either managing the problem themselves or knowing when to seek appropriate professional help
- enabling people to access the skills necessary to manage and take responsibility for their own condition in the long term and to be able to lead full and independent lives.

Condition	Assessment and management of those with the earliest features of a musculoskeletal condition
Osteoarthritis	<p>The strategies outlined for those at risk should be undertaken including education programs to encourage self-management. This should include information on the condition, lifestyle and its treatment.</p> <p>There should be pain management including the use of topical analgesics, simple analgesics and NSAIDs.</p> <p>Normal biomechanics should be restored, including osteotomy, ligament and meniscal surgery where indicated.</p> <p>Environmental adaptations in the home and workplace and the use of aids, braces or devices should be considered.</p> <p>The use of glucosamine sulphate, chondroitin sulphate or hyaluronic acid and of I/A therapies (including corticosteroids, hyaluronic acid and tidal irrigation) should be considered.</p>
Rheumatoid arthritis	<p>For those with the early stages of rheumatoid arthritis it is important that a correct diagnosis is made by expert assessment within 6 weeks of onset of symptoms.</p> <p>Disease modifying anti-rheumatic drug (DMARD) treatment should be started in addition to symptomatic therapy and rehabilitative interventions as soon the diagnosis of rheumatoid arthritis is established. The choice of treatment should take into account the presence of prognostic indicators supporting the use of more aggressive therapy. Treatment should be closely monitored to ensure ideal disease control.</p> <p>There should be education programmes to encourage self-management. These should include information on the condition, lifestyle and its treatment.</p> <p>Treatment should consider all aspects of the effect of the condition on the person.</p> <p>People with rheumatoid arthritis should be enabled to participate as fully as possible through rehabilitation and modification of the work, home and leisure environment.</p>
Back pain	<p>There should be a strategy to encourage the population to change behaviour and beliefs about back pain and on the importance of maintaining physical activity and employment by those with acute or subacute back pain.</p> <p>On a background of public awareness, health cares professionals should learn to follow the appropriate guidelines which recommend staying active; avoiding bed rest; using paracetamol, NSAIDs or manual therapy and addressing “red” and “yellow” flags.</p>

Osteoporosis	<p>For the population with osteoporosis (BMD T score ≤ -2.5) there should be educational and lifestyle advice programmes.</p> <p>For those identified as having a high risk of fracture there should be appropriate pharmacological interventions.</p> <p>For older people at high risk of falling there should be in addition a falls prevention programme.</p>
Major musculoskeletal injuries	<p>There should be immediate accurate diagnosis and appropriate treatment on the scene.</p> <p>In addition there should be stabilisation of basic life functions; systemic pain management; consideration of immobilisation, if unstable; early transportation to centre with appropriate experience and equipment.</p> <p>Consider operative or non-operative stabilisation of fractures; immediate operative treatment if further deterioration is expected; adequate fluid and nutrition management; pulmonary, cardiovascular and neurological complications.</p> <p>Prevent complications (infection, thrombosis, embolism, heterotopic ossifications).</p> <p>Start early mobilisation and rehabilitation.</p>
Occupational musculoskeletal injuries	<p>There should be early accurate diagnosis and treatment.</p> <p>In addition there should be pain management including systemic and topical analgesics; partial work restriction.</p> <p>Consider short-term immobilisation and the use of aids, braces or devices.</p> <p>Maintain physical fitness during rehabilitation.</p> <p>Understand the mechanism of injury and prevent future injuries by considering adaptation work place, transferring the patient to another job or distinct job modification.</p> <p>Return to work early.</p>
Sports injuries	<p>There should be early accurate diagnosis and treatment.</p> <p>RICE - rest, ice, compression and elevation.</p> <p>Pain management including systemic and topical analgesics.</p> <p>Consider immobilisation, if unstable – early mobilisation, if stable; the use of aids, braces or devices; immediate operative treatment if further deterioration is expected; operative reconstruction of tendons, capsule and ligaments; operative or non-operative stabilisation of fractures.</p> <p>Maintain physical fitness during rehabilitation.</p> <p>Return to sport when pain free and able to carry out all skills required by the sport.</p> <p>Understand the mechanism of injury and prevent future injuries.</p> <p>Consider adaptation of special technique in sport.</p>

Strategies for those with musculoskeletal problems

To prevent the enormous impact on the quality of life of individuals and socio-economic impact on society related to musculoskeletal conditions, those with a musculoskeletal condition (who have pain, impairment of function, limitation of activities and restriction of participation) should have fair (considers equity, timeliness and ethics) opportunity of access to appropriate care which will reduce pain and the consequences of musculoskeletal conditions, with improvement in functioning, activities and participation. These outcomes should be achieved in the most cost effective way possible for the appropriate environment.

This requires that those who have musculoskeletal conditions have access to appropriate health and social care, and support in the home and workplace. There should be equity of access to care, which should have demonstrated benefit and appropriateness to meet their needs.

The following approaches are recommended for assessment and management to achieve the best outcomes. These are on a background of:

- enabling people to know what to do, either managing the problem themselves or knowing when to seek expert help
- enabling people to access the skills necessary to manage and take responsibility for their own condition in the long term and to be able to lead full and independent lives.

Condition	Recommended management those with various established musculoskeletal conditions (established musculoskeletal condition strategy)
Osteoarthritis	<p>The strategies outlined for those at risk should be undertaken including education programs to encourage self management. These should include information on the condition, lifestyle and its treatment.</p> <p>There should be pain management including the use of topical analgesics, simple analgesics and anti-inflammatory analgesics (NSAIDs).</p> <p>The use of glucosamine sulphate, chondroitin sulphate or hyaluronic acid and of I/A therapies (including corticosteroids, hyaluronic acid and tidal irrigation) should be considered.</p> <p>Normal biomechanics should be restored, including osteotomy, ligament and meniscal surgery where indicated. Joint replacement surgery should be considered for end-stage joint damage that is causing unacceptable pain or limitation of function. Surgery should be timely.</p> <p>There should be rehabilitation programmes to improve function, activities and participation. The use of aids, braces or devices should be considered. Environmental adaptations in the home and workplace should be considered.</p>
Rheumatoid arthritis	<p>DMARD treatment should be continued in addition to symptomatic therapy and rehabilitative interventions.</p> <p>Treatment should be expertly monitored to ensure ideal disease control. The choice of treatment should take into account the presence of prognostic indicators supporting the use of more aggressive therapy.</p> <p>Surgery should be considered for end-stage joint damage that is causing unacceptable pain or limitation of function. Those with late stage rheumatoid arthritis may have greater surgical needs and a co-ordinated approach is required. Surgery should be timely.</p> <p>Treatment should consider all aspects of the effect of the condition on the person.</p> <p>There should be rehabilitation programmes and modification of the work, home and leisure environment to enable people with rheumatoid arthritis to participate as fully as possible.</p>
Back pain	<p>Effective treatments for subacute and chronic non-specific back pain are exercise therapy, behavioural therapy including pain management or a combination of these.</p> <p>Multi-disciplinary programs should be delivered for non-specific back pain if there is no improvement with exercise or behavioural therapy. It is as yet unclear what the optimal content of these programs is.</p> <p>Rehabilitation should be undertaken with consideration and involvement of the workplace.</p> <p>Back pain of known cause (specific back pain) needs specific management.</p>

Osteoporosis	<p>For those with established osteoporosis there are a number of key strategies that depend on the severity and stage of the disease. The appropriate strategy will consist of one or a combination of the following:</p> <ul style="list-style-type: none"> • education and lifestyle advice • analgesia when indicated • physiotherapy when indicated • pharmacological intervention with bone active drugs • falls prevention programme in older people at high risk of falling • calcium and vitamin D supplementation in frail older people • orthopaedic management of fracture when indicated • multi-disciplinary rehabilitation • nutritional support • hip protectors for frail older people in residential care or nursing homes
Major musculoskeletal injuries	<p>Pain management including systemic and topical analgesics.</p> <p>Consider definitive operative treatment, including stabilisation, reconstruction of biomechanics, arthroplasty, reattachment of limbs, amputation, and plastic surgery.</p> <p>Consider definitive non-operative treatment, including use of aids, braces or devices or prosthetic devices.</p> <p>Start early mobilisation and rehabilitation.</p> <p>Consider reintegration into work process and society.</p>
Occupational musculoskeletal injuries	<p>Pain management including systemic and topical analgesics.</p> <p>Partial work restriction.</p> <p>Consider the use of aids, braces or devices.</p> <p>Maintain physical fitness during the rehabilitation.</p> <p>Understand the mechanism of injury and prevent future injuries by considering modification of task and work organisation, transferring the patient to another job or distinct job modification.</p> <p>Return to work early.</p>
Sports injuries	<p>Pain management including systemic and topical analgesics.</p> <p>Consider in depth diagnosis, including MRI, diagnostic arthroscopy etc.</p> <p>Consider operative reconstruction of tendons, capsule and ligaments.</p> <p>Consider operative or non-operative stabilisation of fractures.</p> <p>Active rehabilitation with joint specific exercises.</p> <p>Maintain physical fitness during the rehabilitation process.</p> <p>Return to sport when pain free and able to carry out all skills required by the sport.</p> <p>Multi-disciplinary approach for the care of athletes should involve coach, physiotherapist, physician, physiologist, psychologist, nutritionist, podiatrist and biomechanics.</p> <p>Evaluate the mechanism of injury and training errors to prevent future injuries.</p> <p>Based on understanding the rules, the physiological stresses and the injury mechanism consider adaptation of training and technique.</p>

What are the implications of implementation of these strategies? What does this mean for different stakeholders?

The implementation of these strategies requires actions at all levels: the European and national political level; the employer level; the health care and social care professional; the patient and carer level and the public as a whole. Firstly we need to consider the actions required to implement these strategies and secondly what this implies for these different stakeholders. In this way we can identify what needs to be done by whom to implement the recommended strategies for the whole population,

for those at risk and for those with a musculoskeletal condition. Suggestions of such actions required to implement the recommended strategies are given in the following tables.

What actions are necessary to prevent musculoskeletal problems and conditions where possible and to ensure that those people with musculoskeletal problems and conditions enjoy life with quality and independence:

General

- ⇒ A comprehensive health strategy to address the determinants of musculoskeletal health should be developed at the European, national and local levels. This should consider health promotion, prevention, treatment and rehabilitation of musculoskeletal conditions based on the recommendations of this report.
- ⇒ It should be ensured that musculoskeletal conditions reach the political agenda at all levels, recognising the importance of musculoskeletal health and making appropriate priorities with resources.
- ⇒ Priority should be given at the European and national level to the research needs of musculoskeletal conditions. European and national research programmes should be developed that will lead to a better understanding of the causes of musculoskeletal conditions and their effects on people, more effective prevention and treatment and to recognise the need to evaluate the cost effectiveness of strategies for their prevention.
- ⇒ Programmes to prevent musculoskeletal problems and conditions should link with existing priorities and activities, such as around determinants of health, where there are opportunities for mutual benefit.
- ⇒ Data should be collected, for example as part of health interview surveys, to monitor determinants for, occurrence and impact of musculoskeletal conditions in all European states in a standardised manner. This will enable the quantification and monitoring of the scale of the problem and the effect of the implementation of any health strategies.

To implement strategies for the whole population

- ⇒ The awareness of the public and of health professionals should be raised about the scale and impact of musculoskeletal conditions and of the options for prevention and treatment.
- ⇒ People at all ages should be empowered to be responsible for their own musculoskeletal health by access to information about a musculoskeletal healthy lifestyle supported through public health programmes, health promotion campaigns and healthy workplace programmes.
- ⇒ This requires actions by the whole community including policy makers, providers of health and social care, employers and the public.
- ⇒ Health promotion initiatives should be harmonised and synergies explored where there are similar recommendations such as for cancer and cardiovascular disease.
- ⇒ Data should be collected, eg in health interview surveys, to monitor determinants for, occurrence and impact of musculoskeletal conditions in all European states in a standardised manner. This will enable the quantification and monitoring of the scale of the problem and the effect of the implementation of any health strategies.
- ⇒ Employment and disability legislation should be appropriate for the maintenance of musculoskeletal health.
- ⇒ Safe communities should be created that reduce the risk of accidents and facilitate a musculoskeletal healthy lifestyle.
- ⇒ Workplaces should be created that provide appropriate ergonomics, reduce risk of accidents and optimise psychological stress.

To implement strategies for the at risk population

- ⇒ Case finding approaches should be implemented for the different musculoskeletal conditions aimed at identifying those individuals who are most at risk of future problems related to musculoskeletal diseases and who will benefit from evidence-based interventions. This should be through
 - Clinical guidelines that are accepted by peers
 - Provision of appropriate resources
 - Use of information systems
 - Ensuring competency of health care providers
- ⇒ Actions should be taken across the community to reduce the risk factors for musculoskeletal conditions.
- ⇒ People at all ages should be empowered to be responsible for their own musculoskeletal health and understand by access to information and education about their personal risks and of the actions they can take to reduce their risks through public health programmes, health promotion campaigns and healthy workplace programmes.
- ⇒ Further research should be undertaken to better identify those at most risk of musculoskeletal conditions to enable more effective targeting of strategies for prevention.

To implement strategies for those with a musculoskeletal condition

- ⇒ Those with any of the different musculoskeletal conditions, at any stage from the earliest features, should be assessed and managed by someone with the appropriate competency and have timely access to care that is appropriate to their needs (equity) through
 - Implementation of evidence based guidelines for early management with appropriate resources
 - Quality assurance mechanisms for guidelines and outcome of care
 - Access to
 - education
 - symptom control
 - disease modifying therapy when indicated
 - rehabilitation
 - multi-professional and multi-disciplinary integrated approach to care as required
 - support to minimise impact on home, work and leisure activities
- ⇒ Timely access for those with the earliest features of a musculoskeletal condition is most important to minimise the associated morbidity.
- ⇒ People at all ages should be empowered to be responsible for their own musculoskeletal health by access to information and education to enable them to recognise the early features of a musculoskeletal condition and to know what to do, through both managing the problem themselves and knowing when to seek expert help.
- ⇒ The stigmas associated with musculoskeletal conditions should be reduced and a positive attitude created to facilitate early presentation to the healthcare system through education and raising awareness.
- ⇒ People with an established musculoskeletal conditions should also be empowered to know what to do, through both managing the problem themselves and knowing when to seek expert help through information, education and training.
- ⇒ People should be enabled to access the skills necessary to take responsibility for their own musculoskeletal condition in the long term, make informed choices and to be able to lead full and independent lives through
 - Access to high quality information so that people can develop and maintain an informed dialogue with health and social care professionals
 - Self management programmes / expert patient groups

- ⇒ People should be enabled to participate in home, work and leisure activities through environmental adaptation, provision of services and sickness benefit regulations.
 - ⇒ People should be enabled to stay at work or in education by health care, social support, education and training, and employment policies, which are linked where appropriate. For example:
 - Flexible education and training arrangements
 - Flexible working arrangements
 - Flexible benefits and social support
 - ⇒ There should be an integrated approach to those with musculoskeletal conditions between health and social care professionals.
-
- ⇒ There should be appropriate education and competency of health professionals to manage musculoskeletal conditions in an evidence-based way at all levels of health care provision.
-

What are the implications for the different stakeholders?

These actions have implications for what the different stakeholders need to do. Recommendations are given for each level:

European Political Level

- ⇒ Develop and implement European plans and policies that
 - recognise the importance of musculoskeletal health
 - encourage & facilitate the implementation of this strategy
 - explicitly refer to musculoskeletal conditions alongside existing priorities and activities for other disease areas where there is mutual benefit such as within public health policies and initiatives for common determinants of health.
 - give priority to the need for research and for programmes to be developed that will lead to a better understanding of the causes of musculoskeletal conditions and their effects on people, and secondly the need to evaluate the cost effectiveness of strategies for their prevention.
 - ⇒ Recognise political salience of reducing the burden of musculoskeletal conditions
 - ⇒ Initiate data collection, for example as part of health interview surveys, to monitor determinants for, occurrence and impact of musculoskeletal conditions in all European States in a standardised manner.
 - ⇒ Support cross-sectoral working and bring together policies of mutual benefit for musculoskeletal health eg bringing together health, social, education, transportation and housing policies.
 - ⇒ Develop policies to keep people at work despite their musculoskeletal condition.
 - ⇒ Encourage national implementation of guidelines for case-finding appropriate to local population.
-

National Political Level

- ⇒ Develop and implement national and regional plans / policies that
 - recognise the importance of musculoskeletal health and give appropriate priority to the improvement of musculoskeletal health that is commensurate with the burden of these conditions.
 - encourage & facilitate the implementation of this strategy, recognising political opportunities and providing necessary resources.
 - explicitly refer to musculoskeletal conditions alongside existing priorities and activities for other disease areas where there is mutual benefit such as within public health policies and initiatives for common determinants of health.
 - give priority to the need for research and for programmes to be developed that will lead to a better understanding of the causes of musculoskeletal conditions and their effects on people, and secondly the need to evaluate the cost effectiveness of strategies for their prevention.
- ⇒ Initiate data collection, for example as part of health interview surveys, to monitor determinants for, occurrence and impact of musculoskeletal conditions in a standardised manner to other European States.
- ⇒ Provide public health programmes that implement the recommended strategies, including actions to reduce known risk factors.
- ⇒ Health and safety legislation appropriate to maintaining musculoskeletal health.
- ⇒ Support cross-sectoral working - bring together policies of mutual benefit eg bringing together health, social, education, employment, transportation and housing policies
- ⇒ Initiate development and implementation of guidelines for case-finding appropriate to local population and provision of resources and incentives for the implementation of these guidelines.
- ⇒ Implement guidelines for early management of musculoskeletal conditions appropriate to the local population and provision of resources and incentives for the implementation of these guidelines.
- ⇒ Ensure health systems provide timely access to care with equity of access for the various musculoskeletal conditions where early actions will alter outcomes.
- ⇒ Develop quality assurance mechanisms for guidelines.
- ⇒ Ensure competency of providers of care, including establishing standards for education and training of health and social care professionals.
- ⇒ Develop and implement policies to keep people at work despite their musculoskeletal condition, such as flexible working arrangements, flexible benefits and appropriate social support.

Employer Level

- ⇒ Create a good workplace that provides appropriate ergonomics, reduces the risk of accidents and minimises psychological stress.
- ⇒ Provide access to appropriate lifestyle advice and offer workplace programmes to discourage smoking and provide healthy food.
- ⇒ Offer opportunities to keep people in employment or to facilitate early return to employment through work adjustment or flexibility in working hours.
- ⇒ Timely provision of vocational and professional rehabilitation.

Health and Social Care Professional Level

- ⇒ Ensure all health and social professionals are aware of the need for and possibilities for prevention, and to promote them.
 - ⇒ Have an advocacy role, communicating the burden of disease to public, politicians and peers, and promoting strategies for their prevention and treatment.
 - ⇒ Develop a more integrated approach between health and social care professionals and identify mutual benefits across sectors.
 - ⇒ Ensure appropriate competency of health and social care professionals so that they are able to (a) recognise and advise those at risk and are (b) able to manage those with a musculoskeletal problem appropriate to their needs including recognising when they require timely and / or more expert management (triage).
 - ⇒ Prioritise resources into appropriate services to improve musculoskeletal health (financial, physical and human).
 - ⇒ Implement guidelines for management of musculoskeletal conditions at all stages appropriate to local population that include identification of those who need most rapid assessment and management.
 - ⇒ Provide integrated, co-ordinated, seamless, multi-professional, multi-disciplinary care.
 - ⇒ Establish quality assurance systems to ensure the best outcomes for those with musculoskeletal conditions.
-

Patient / Carer Level

- ⇒ Recognise the patient / carer potential educational role to the community by engaging with other stakeholders and relating experience.
 - ⇒ Understand the concept of being a person at risk, take a responsibility to maintain your own musculoskeletal health and ensure that you have access to reliable and up-to-date information to minimise your risk of developing a musculoskeletal condition.
 - ⇒ Reduce the stigma associated with musculoskeletal conditions and create a positive attitude to facilitate early presentation to the healthcare system through education and raising awareness.
 - ⇒ Enable people to recognise the early features of a musculoskeletal conditions and to know what to do, either managing the problem themselves or knowing when to seek expert help.
 - ⇒ Enable people to access the skills necessary to manage and take responsibility for their condition in the long term and to be able to lead full and independent lives.
 - ⇒ Ensure access to high quality information so that people can develop and maintain an informed dialogue with health and social care professionals.
 - ⇒ Ensure access to early assessment and management, including access to self-management courses where available.
 - ⇒ Be aware of your rights and access to education, training and employment.
-

Public Level

- ⇒ Raise children to actively participate in physical activities, have body awareness and maintain this throughout life through education, public awareness and health promotion.
 - ⇒ Take responsibility to maintain own musculoskeletal health.
 - ⇒ Be aware of the need for and possibilities for prevention of musculoskeletal problems and be able to make informed choices through education.
 - ⇒ Take steps to identify your individual risk and need for intervention by accessing information and other methods of risk assessment.
 - ⇒ Reduce the stigma associated with musculoskeletal conditions and encourage others in the community to take early action to reduce their risk.
-

How to make it happen

Health strategies need plans for implementation if they are to achieve their goals of improving health. Implementation may be at either a national or local level but the principles are similar. Identify the needs and priorities, choose from the various strategies what is most relevant and feasible and identify what level you need to achieve changes — the political, employer, health and social care professional, the patient and their carer and at the public level. Then develop and carry through an implementation plan following key principles the most important of which is to identify those stakeholders who will champion change.

Principles of Implementation
<ul style="list-style-type: none"> • Dissemination of this report’s recommendations should be planned, targeted and evaluated • Dissemination needs to be supplemented by active implementation strategies • Identify local, regional, national and /or international champions for change • Establish a task group to develop an implementation plan to change policies and / or clinical practice • Set clear and specific objectives that relate to your particular needs and priorities • Provide a rationale for action • Identify decision makers and their stage of readiness to change • Adopt a multifaceted approach to achieving change • Identify opportunities for integration with existing programmes • Think big but start small with strategies that are likely to have positive results • Evaluate for cost and clinical effectiveness

Evaluating the effectiveness of strategies for the prevention and treatment of musculoskeletal conditions

The strategies can be evaluated by considering their dissemination, their application or the actual improvement in musculoskeletal health. Indicators for monitoring musculoskeletal health have been recommended by the European Commission “Indicators for Monitoring Musculoskeletal Problems and Conditions” project available at http://europa.eu.int/comm/health/ph_projects/2000/monitoring/fp_monitoring_2000_frep_01_en.pdf. The application of these across the community in surveys and registers will enable the effect of any strategies to be measured. Although many of the recommendations could show benefit in less than 5 years, such a result on musculoskeletal health may take longer to demonstrate. Measures of implementation are

a more realistic outcome and surveys need to be undertaken to identify initiatives across Europe that are implementing these strategies and to enable each to learn from another about the barriers and facilitators to their successful application. More research is needed as to how to make change happen so that the enormous advances in understanding of these conditions and in therapeutics are taken through to the bedside and the community as a whole to result in better musculoskeletal health. It is also a priority to identify better ways of preventing these conditions in view of their high and rising prevalence and enormous personal and societal impact.

Introduction

Background

Musculoskeletal conditions are common and their impact is pervasive. They are the most common cause of severe longterm pain and physical disability. They significantly affect the psychosocial status of the individuals with the condition as well as their families and carers (1;2). They are a major burden on health and social care.

In Europe 20 - 30% of adults are affected at any one time by musculoskeletal pain (3-5). The WHO Global Burden of Disease Monitoring Programme has identified osteoarthritis as one of the top ten causes of disability for countries within the EU and back pain as a major cause of work incapacity. Using disability adjusted life years (DALYs), OA is the 4th most frequent predicted cause of problems world-wide in women, and the 8th in men (6). There is a 40% lifetime risk of fracture for women over 50 years in Europe and the burden of osteoporosis is increasingly with increased life expectancy (7). Two in 5 people with a musculoskeletal problem are limited in their everyday activities (8). Musculoskeletal conditions, excluding trauma, represent almost 25% of the total cost of illness in European countries (9). Musculoskeletal conditions are the second most common reason for consulting a doctor, and in most countries constitute up to 10 to 20% of the primary care practice (10). One in 5 of all Europeans are under longterm treatment for rheumatism and arthritis (3). They are the commonest cause of health problems limiting work, and up to 60% of persons on early retirement or longterm sick leave claim musculoskeletal problem as the reason (11).

Throughout Europe, the burden on the individual and society of musculoskeletal conditions will increase dramatically. The prevalence of many of these conditions increases markedly with age and many are affected by lifestyle factors such as obesity, smoking and lack of physical activity. With the increasing number of older people and the changes in lifestyle occurring throughout Europe, the burden is predicted to increase dramatically unless action is taken now. This has been recognised by the UN and WHO with the endorsement of the Bone and Joint Decade (12), an initiative that is globally supported by professional, scientific and patient organisations (13;14;15;16).

The aim of this report is to identify the priorities for action and highlight those strategies, supported by "best" available evidence that will reduce the incidence and impact on the individual and society of musculoskeletal diseases in Europe. The range of interventions available cover all stages of prevention, from those that will reduce

risk for the normal population to those that will improve the quality of life for those with these conditions.

The WHO Health For All Programme has called for people with disabilities to have substantially improved opportunities for health, requiring health promotion and protection at earlier ages to achieve this target. Health21 (17) has emphasised the importance of integrated care and rehabilitation to enable people with chronic disease to achieve an active independent life. A 1998 EU Report on osteoporosis and subsequent action plan (7;18) have called for the promotion of bone health and for early diagnosis and treatment to be improved and the WHO Task Force on Osteoporosis is making globally applicable recommendations.

Certain strategies exist at a national level for osteoporosis and certain other conditions such as back pain but application at a regional / district level is variable and limited throughout the member states. However there have been no specific European initiatives to identify practical and comprehensive policy recommendations that will reduce the risk of, and morbidity associated with, common musculoskeletal conditions which include inflammatory and degenerative joint diseases, back pain and other spinal disorders, osteoporosis and major limb trauma.

This project seeks to redress this problem by providing a comprehensive document, which enables strategies to be put in place at the national, regional and local level that will have a major impact on the burden of the spectrum of musculoskeletal conditions.

The focus of this report is based on three important principles. Firstly, to ensure that, where possible, all the recommended strategies to tackle the burden of musculoskeletal conditions are based on the best and most recent evidence available. Secondly, that it is comprehensive thus ensuring it considers the spectrum of conditions that affect musculoskeletal health, reflects all the available evidence and covers all aspects of the prevention and control of musculoskeletal conditions from primary prevention through to rehabilitation. Thirdly, and most importantly, that it is user centred both at the population and individual level.

To achieve this, experts in the various musculoskeletal conditions from the different relevant disciplines and from across the European Community have worked together to produce integrated recommendations for the prevention and control of the spectrum musculoskeletal conditions.

Aims

The goals of the project are to prevent musculoskeletal problems and conditions where possible, and to ensure that those people with musculoskeletal conditions enjoy a life with fair quality as independently as possible. This will reduce the chronic burden of musculoskeletal conditions in Europe in the future.

The specific aims of the project to achieve this are:

- To develop from existing knowledge a common public policy to deal with risk factors to musculoskeletal health in an integrated, sustainable, contextually appropriate way, tackling both behavioural factors and environmental exposure.
- To develop from existing knowledge a common public policy to enable people with musculoskeletal disease to enjoy their full health potential and play an active social role, in accordance with their needs and views.
- To make recommendations for the dissemination and implementation of these policies at the regional and district level, and wherever possible link into existing health promotion and collaborative networks.
- To monitor the dissemination and implementation of these recommendations.

How it has been achieved?

These have been achieved by:

- Documenting the impact of musculoskeletal conditions to set priorities.
- Identifying risk factors that impact on both the development and outcome of musculoskeletal conditions and hence facilitate the development of strategies and priorities for their prevention.
- Identifying commonality between the musculoskeletal conditions when identifying targets for intervention by using the framework of the WHO International Classification of Functioning, Health and Disability.
- Identifying commonality between the interventions used for the prevention and control of the various musculoskeletal conditions.
- Identifying interventions by evidence of efficacy from randomised-controlled trials, meta-analysis, systematic reviews and evidence based guidelines for the different stages of any condition – from prevention in the normal

population, prevention in people at high risk and treatment at early and late stages.

- Developing recommendations based on evidence of effectiveness in clinical practice.
- Developing strategies that are based on evidence and experience.
- Making recommendations for their implementation, identifying barriers and ways in which implementation can be facilitated.
- Monitoring the dissemination and implementation of these policies.

In summary, this report gives recommendations for the promotion of musculoskeletal health at all stages that is based on the best evidence and expert opinion. Those people at greatest risk and who require priority attention are identified. An operational programme for practical implementation of the musculoskeletal health policy at the regional / district level across the European Union is proposed.

Participants

The project has been undertaken in partnership between the Bone and Joint Decade, EULAR, EFORT and IOF.

It has been led by a Project Management Group, supported by a Project Team and supported by Experts from a wide range of specialities from across Europe. There has also been widespread consultation with scientific, professional and patient organisations from across Europe.

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Part 1

The Problem

1.1 Musculoskeletal conditions

- What are they?
- How common are they?
- What is the impact on the individual?
- What is the impact on society?
- What is going to happen?

1.2 Osteoarthritis

- What is it?
- How common is it?
- What is the impact on the individual?
- What is the impact on society?
- What is going to happen?

1.3 Rheumatoid arthritis

- What is it?
- How common is it?
- What is the impact on the individual?
- What is the impact on society?
- What is going to happen?

1.4 Back pain

- What is it?
- How common is it?
- What is the impact on the individual?
- What is the impact on society?
- What is going to happen?

1.5 Osteoporosis

- What is it?
- How common are they?
- What is the impact on the individual?
- What is the impact on society?
- What is going to happen?

1.6 Musculoskeletal trauma

- Major limb trauma
 - What is it?
 - How common is it?
 - What is the impact on the individual?
 - What is the impact on society?
 - What is going to happen?
- Sports injuries
 - What are they?
 - How common are they?
 - What is the impact on the individual?
 - What is the impact on society?
 - What is going to happen?
- Occupational injuries
 - What are they?
 - How common are they?
 - What is the impact on the individual?
 - What is the impact on society?
 - What is going to happen?

1.1 Musculoskeletal Conditions

What are they?

Musculoskeletal conditions are common and their impact is pervasive. They are the most common cause of severe longterm pain and physical disability. They are a major burden on health and social care.

Musculoskeletal conditions are a diverse group of conditions with regards to pathophysiology. They are brought together not only by the musculoskeletal structures affected but by their association with pain and impaired physical function. They include a spectrum of conditions from those of acute onset and short duration to life long disorders. The most important conditions in terms of frequency and impact are osteoarthritis, rheumatoid arthritis, osteoporosis including fragility

fractures, low back pain, and musculoskeletal injuries such as high energy limb fractures, strains and sprains often related to occupation or sports.

The burden can be considered either in terms of the problems associated with musculoskeletal conditions, that is those people with the consequences of pain or impaired functioning related to the musculoskeletal system, or alternatively the burden can be related to the cause, such as joint disease or trauma. It can also be considered in terms of who is at risk.

The extent of the problem and its burden on patients and society can be understood from some examples:

Burden of disease

- Almost one-quarter of Europeans suffer some form of rheumatism or arthritis (1). These are the commonest chronic illnesses in Europe.
- 50% of the adult population report musculoskeletal pain for at least 1 week in the last month (2).
- Musculoskeletal conditions are the 8th leading cause of disease burden across Europe and osteoarthritis and rheumatoid arthritis account for 3.5% of disability adjusted life years (DALYs) lost (3).
- *Joint diseases* account for half of all chronic conditions in persons aged 65 and over.
- *Back pain* is the second leading cause of sick leave.
- *Fractures* related to *osteoporosis* have almost doubled in number in the last decade; it is estimated that 40% of all women over 50 years in age will suffer from an osteoporotic fracture.
- The *severe injuries* caused by traffic accidents produce a tremendous demand for preventive and restorative help.

Impact on individuals

- Work-related musculoskeletal disorders were responsible for 11 million days lost from work in 1995 in the UK (4).
- Sports activities have unwanted side effects on the individual which include sports injuries of variable severity and adverse short term health effects among individuals with compromised health (5).
- Musculoskeletal conditions cause more functional limitations in the adult population in most welfare states than any other group of disorders (6).
- The prevalence of physical disabilities due to a musculoskeletal condition has repeatedly been estimated to be 4-5% of the adult population (7).

Costs to society

- Musculoskeletal conditions were the most expensive disease category in the Swedish cost of illness study, representing 22.6% of the total cost of illness. 90% of these were indirect costs (31.5% sick leave, 59% early retirement) (8;9). The total costs were attributable to back pain (47%), Osteoarthritis (14%) and RA (5.5%).
- Musculoskeletal conditions (WHO ICD 9th revision, chapter XIII, ICD codes 710-739) (10) ranked second in the Netherlands as a health care cost in 1994 (11), accounting for 6% of total health care costs compared to 8.1% for mental retardation. The costs were considerable at all ages, ranking fifth at age 15 – 44 years, second at age 45 – 64 years and third age at age 65 – 84 years after dementia and stroke. The inclusion of the costs informal care would have greatly increased the costs.
- One in 5 of all Europeans are under longterm treatment for rheumatism or arthritis (1). These are the commonest reasons for longterm treatment.
- 15-20% of primary care (12) consultations relate to musculoskeletal problems.

How common are they?

Pain and disability associated with the musculoskeletal system:

Musculoskeletal pain is very common. The Eurobarometer Survey (1) found that nearly a quarter of all Europeans has long-standing problems with their muscles, bones and joints (arthritis, rheumatism). These were the commonest chronic illnesses and the most frequent reason for longterm treatment. Other surveys have confirmed this high prevalence (Table 1.1). Back pain is most common. Musculoskeletal pain can often be attributed to specific conditions. Pain is the most prominent symptom in most people with arthritis (13). Pain is the most important determinant of disability in patients with osteoarthritis (14).

Musculoskeletal pain is often recurrent or persistent, with pain continuing beyond the time of healing or remission of a condition. Musculoskeletal pain usually is not limited to one single anatomical structure, but is often widespread. A substantial proportion of patients with chronic back pain also have chronic widespread pain (15). Osteoarthritis and rheumatoid arthritis cause pain in several joints. Pain is always subjective and the perception of pain cannot be described only by diagnosis or in anatomical and physiological terms. It is also a matter of attention, cognition (thoughts and memories), emotions (fear, anxiety, stress, and depression), and

response in behaviour (avoidance, withdrawal, escape, and muscle contraction). Only a minor fraction of the huge problem with longstanding low back pain can be understood by just examining the back for patho-physiological processes.

The prevalence of pain varies with age and with an increase in prevalence up to about 65 years of age (16-18) (Figure 1.1). The higher prevalence with age can be explained partly by a cumulative effect of chronic musculoskeletal conditions, which become more prevalent with older age (Figure 1.2) (19), with joint problems increasing continuously with age (Figure 1.3) (20). A decline in the complaint of pain has been noted over 65 years, a plausible explanation for which could be the decline around the age of retirement of the adverse physical and mental effects of the working place.

In the UK a report on disabled adults from the Office of Population Census and Surveys, found that 30% of disabled people had arthritis (21). A large population study, The Calderdale study (22), which utilised a clinical validation of rheumatic diagnosis and disability, found that 24% of the whole population reported some joint problems. Of those adults with a rheumatic disorder, 8.2% were disabled and of these approximately 5% reported arthritis, mainly osteoarthritis, as the cause.

Table 1.1 Prevalence of Pain Associated with Musculoskeletal Conditions

Country	Sample size	Condition	Age Band	Prevalence %		
				Male	Female	Total
Canada (23)	39,240	Arthritis (physician diagnosis)	20+	10.5	17.6	
USA (24)	6,846	Arthritis (physician diagnosis)	55+			44.3
USA (24)	14,359	Arthritis during last 12 months	55+			47.7
Australia (25)	3,000	Arthritis (physician diagnosis)	15+	16.6	27.6	22.2
Australia (25)	3,000	Osteoarthritis (physician diagnosis)	15+	5.1	11.9	
Australia (25)	3,000	RA (physician diagnosis)	15+	3.2	4.9	
Netherlands (26)	24,191	Musculoskeletal conditions	16+			17.5
Finland (27)	7,217	Reduced work capacity or chronic illness due to any musculoskeletal disease	30+			20.6
Norway (28)	6,681	Musculoskeletal disease ICD	16-66	17.3	20.6	19.0

Figure 1.1 The age- and sex-specific prevalence of chronic musculoskeletal pain in a sample (n=2755) from the general population in southern Sweden (17)

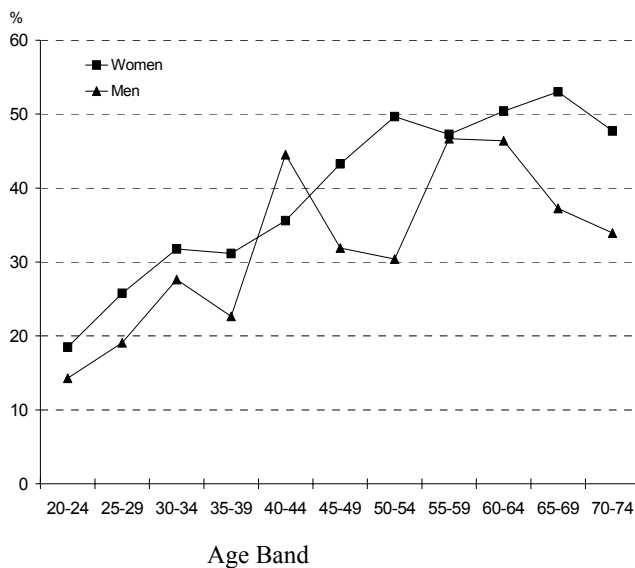


Figure 1.2 The prevalence of self-reported musculoskeletal diseases by age group in the Netherlands (19)

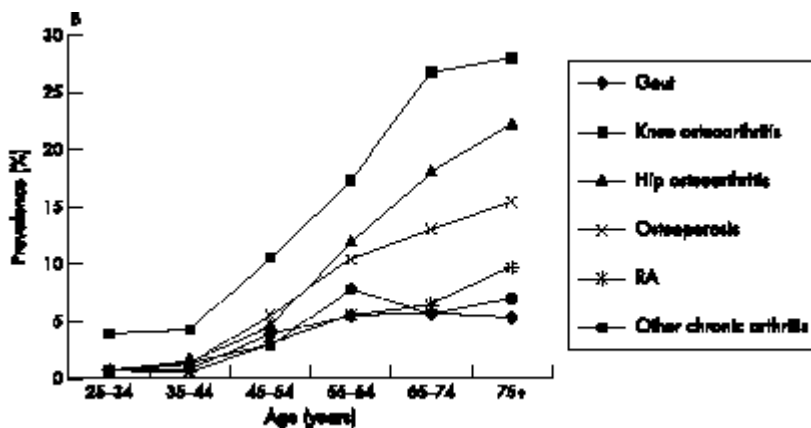
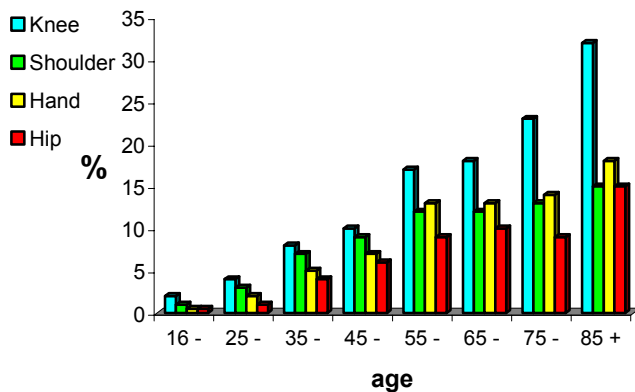


Figure 1.3 Prevalence of Joint Problems in General Population (UK) (29)



What is the impact on the individual?

The impact of musculoskeletal conditions on the individual can be considered within the framework of the WHO International Classification of Functioning, Disability and Health (ICF) (30). The ICF attempts to provide a coherent view of different perspectives of health from a biological, individual and social perspective (Figure 1.4).

Health condition refers to any kind of disorder or disease. It may include information about pathogenesis and/or etiology. There are possible interactions with all components of functioning: body functions and structures, activity and participation. **Body functions** are the physiological (and psychological) functions of body systems. **Body structures** are anatomical parts of the body. Problems in both constructs are **impairments**, which are defined as a significant deviation or loss (e.g. deformity) of structures (e.g. joints) or/and functions (e.g. reduced range of motion, muscle weakness, pain and fatigue). **Activity** is described as the execution of a task or action by an individual. It represents the individual perspective of functioning. Difficulties an individual may have in executing activities are activity **limitations** (e.g. limitations in mobility such as walking, climbing steps, grasping or carrying). **Participation** is described as involvement in a life situation. It represents the societal perspective of functioning. Problems an individual may experience in involvement in life situations are participation **restrictions**. **Disability** serves as an umbrella term for impairments, activity limitations and participation restrictions. So it can be seen as the converse of functioning. A person's functioning and disability is conceived as a dynamic interaction between health conditions (diseases, disorders, injuries, traumas, etc.) and contextual factors. Likewise there are (possible) interactions with all components of functioning and the contextual factors. **Contextual factors** are the factors that together constitute the complete context of an individual's life, and in particular the background against which health states are classified in ICF. There are two components: environmental factors and personal factors. **Environmental factors** refer to all aspects of the external or extrinsic world that form the context of an individual's life and, as such, have an impact on that person's functioning. Environmental factors include the physical world and its features, the human-made physical world, other people in different relationships and roles, attitudes and values, social systems and services, and policies, rules and laws. **Personal factors** are contextual factors that relate to the individual such as age, gender, social status, life experiences and so on. Risk factors could be described in both personal factors (e.g. lifestyle, genetic kit) and

environmental factors (e.g. architectural barriers, living and work conditions) which are associated with musculoskeletal conditions. Risk factors are not only associated with the onset, but interact with the disabling process at each stage. Bi-directional arrows in Figure 1.4 indicate the possibility of 'feedback'. Risk factors also affect the progression of disability and may include, depending on the stage, treatment, rehabilitation, age of onset, financial resources, expectations and environmental barriers. In this report risk factors and contextual factors will be termed **determinants of health**.

Musculoskeletal conditions are characterised by pain and loss of physical function that limits the person's activities and restricts their participation in society. Mobility and dexterity are commonly restricted with an enormous impact on activities.

Musculoskeletal conditions cause more functional limitations in the adult population in most welfare states than any other group of disorders. They are a major cause of years lived with disability in all continents and economies. In the Ontario Health Survey (31) musculoskeletal conditions caused 40% of all chronic conditions, 54% of all longterm disability, and 24% of all restricted activity days. In surveys carried out in Canada, US, and Western Europe, the prevalence of physical disabilities due to a musculoskeletal condition has repeatedly been estimated to be 4-5% of the adult population (7). The prevalence is higher in women, and increases strongly with age. Musculoskeletal conditions are the main cause of disability in older age groups.

There has been a growing interest in describing the impact of musculoskeletal disorders in terms of the affected individual's own experience of their health status or health related quality of life. These are looking at the limitation of activities and restriction of participation associated with the disorder. Several instruments for health status measurement, both generic and disease specific have evolved during the past 20 years. More widely used generic instruments are the Sickness Impact Profile, (32) the Nottingham Health Profile, (33) and the SF-36 Health Survey (34). The SF-36 is the most widely used generic instrument for measuring perceived health status in various diseases and conditions, and has been suggested to be the most appropriate generic instrument in the evaluation of musculoskeletal disorders (35;36). The SF-36 has been reported to discriminate between groups of patients with different disease severity and also to be responsive to changes of conditions, such as low back pain (37), chronic widespread pain and fibromyalgia (38), osteoarthritis and rheumatoid arthritis (39;40), and musculoskeletal disorders after injury in workers (35). Health related quality of life as

measured by SF-36 in subjects with longstanding non-malignant pain, has been reported to be among the lowest seen for any medical condition (41). Figure 1.5 shows SF-36 scores for subject with chronic regional musculoskeletal pain (CRP), chronic widespread pain, fibromyalgia, and rheumatoid arthritis (RA) in a Swedish population study (42). Figure 1.5 shows SF-36 scores for hip osteoarthritis preoperative (43), and for comparison

the scores for prostate cancer and chronic pulmonary obstructive disease (44).

Chronic disease have been ranked in terms of impact on quality of life by identifying SF-36 or SF-24 data in 8 datasets on 15,000 people in the Netherlands (45) (Figure 1.6). The summed rank showed that musculoskeletal conditions were associated with the worst quality of life.

Figure 1.4 WHO International Classification of Functioning, Disability and Health (30)

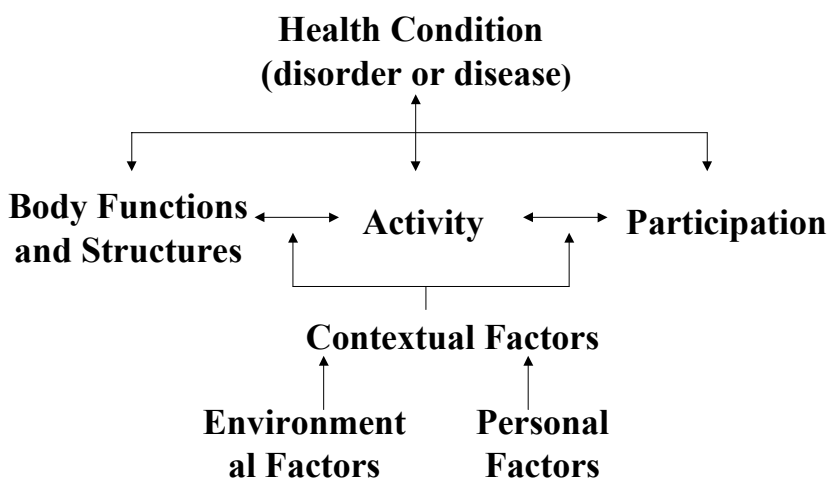


Figure 1.5 SF-36 scores for subject with (a) chronic regional musculoskeletal pain (CRP), chronic widespread pain (CWP), fibromyalgia (FM), and rheumatoid arthritis (RA) and (b) for hip osteoarthritis preoperative, prostate cancer and chronic pulmonary obstructive disease in a Swedish population study:

The SF-36 describes quality of life in 8 generic health concepts, considered to be universal and representing basic human functions and well-being. These 8 health concepts are Physical Functioning (PF), Role function - Physical aspect (RP), Bodily Pain (BP), General Health perception (GH), Vitality (VT), Social Functioning (SF), Role function - Emotional aspect (RE) and Mental Health (MH). The score for each of the 8 scales ranges from 0-100. A higher score indicates better health in that aspect. PF, RP and BP correlates mostly to physical dimensions, and RE and MH mostly to mental dimensions of health status. GH, VT and SF correlate to both dimensions.

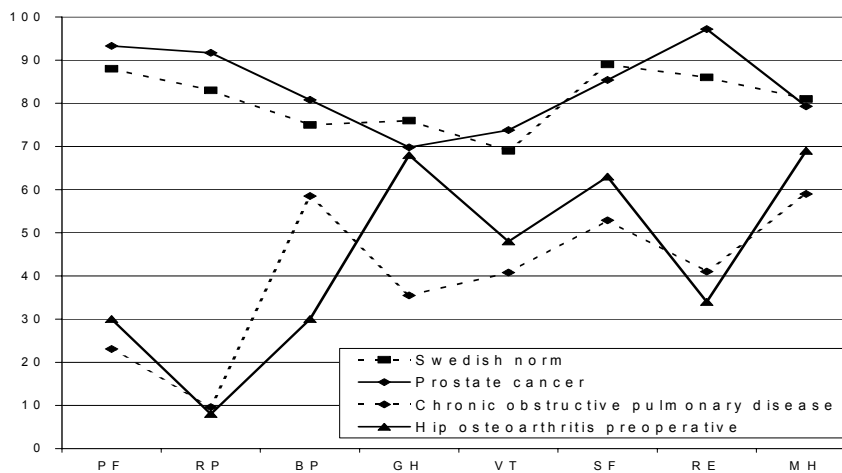
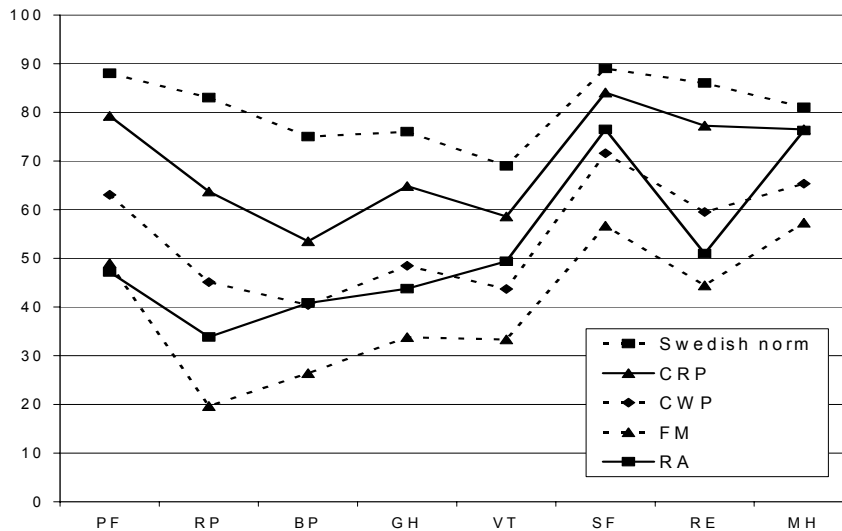
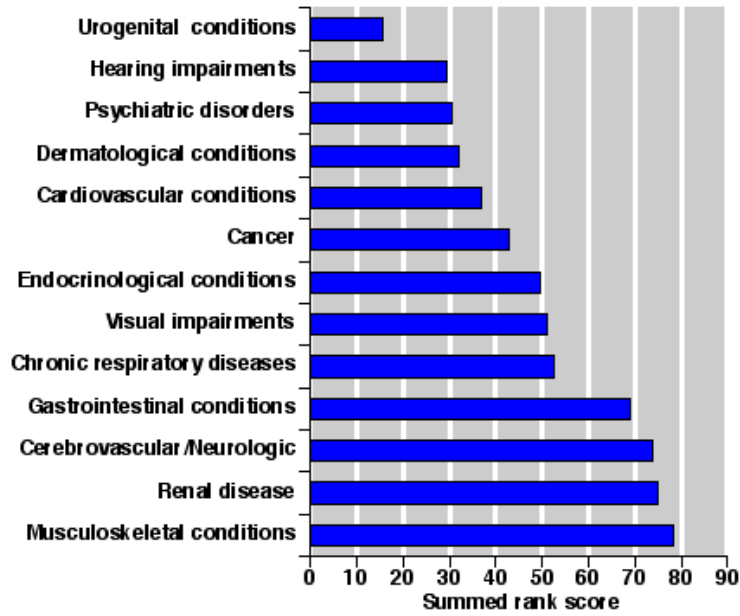


Figure 1.6 Summed rank scores for disease clusters. Higher scores imply poorer quality of life



What is the impact on society?

Musculoskeletal conditions have a major impact on society due to their frequency, chronicity and resultant disability. This will be considered in terms of work disability and

utilisation of health and social care resources. These have economic consequences (Table 1.2).

Table 1.2 Domains of health economic impact relevant to musculoskeletal conditions (46)

Category	Domains	How to identify costs
Direct costs		
Health care costs		
Outpatient costs	Visits to physicians (primary care and specialist)	Hospital or insurer activity data of visits
	Outpatient surgery	
	Emergency room	
	Rehabilitation service utilisation (physiotherapist, occupational therapist, social worker etc)	
	Medication (prescription and non-prescription)	Pharmacy records
	Diagnostic / therapeutic procedures and tests	Radiology activity Laboratory tests,
	Devices and aids	Provision of equipment
Inpatient costs	Acute hospital facilities (without surgery)	Hospital or insurer activity data of admissions, lengths of stay, procedures
	Acute hospital facilities (with surgery)	
	Non acute hospital facilities	Rehabilitation activity Nursing home activity
Personal costs	Transportation	Transportation distance, frequency, methods
	Patient time	Time spent in healthcare
	Carer time	Time spent giving care
Other disease related costs	Home health care services	Home health care activity
	Environmental adaptations	Home, work and transportation adaptations
	Medical equipment (non-prescription)	Equipment provision
	Non-medical practitioner, alternative therapy	Therapist activity
Indirect costs		
Change of living status	Nursing home or residential home	Nursing and residential home activity,
	Home care services	Formal and informal home care activity
Productivity costs	Loss of productivity in employed patients or their carers Opportunity costs – reduced employability at present or higher level	Sick leave, lost wages, work disability benefits, number no longer working, disabilities leading to impaired housekeeping or activities of daily living, loss of productivity
Out of pocket	Out of pocket expenses	Survey
Intangible costs		
	Deterioration in quality of life of patient, family, carers, friends	Difficult to quantify

Work disability

In addition to functional limitations in everyday life, work disability is a major consequence of disease for the individual. A musculoskeletal problem or condition might lead to permanent or temporary loss of work ability. Permanent disability in the economically active population can be estimated on basis of register data on disability pensions. Temporary disability, on the other hand, might be the consequence in milder cases with varying intensity of complaints, and can be estimated from sick leave or worker's compensation claims. A hindrance to these estimates is the lack of consistent diagnoses or causes given to such claims and the lack of reliable registrations systems in many countries.

Musculoskeletal complaints are a major cause of sickness absence, as shown from Scandinavia (47), Poland (48) and the UK (49). In short term sickness absence (less than 1-2 weeks), musculoskeletal health complaints are second only to respiratory disorders (49). Musculoskeletal complaints are the most common medical causes of long term absence, which is more important than short term absence for the individual in terms of consequences and for society in terms of costs. Musculoskeletal injuries and disorders cause more than

half of all sickness absence longer than two weeks in Norway (50). It is difficult to determine precisely the sickness absence that is caused by the different musculoskeletal conditions because of validity of diagnosis but this Norwegian study found that 33% of those persons with sick leave over 4 days had low back pain, 20% neck and shoulder disorders whereas only 3% had rheumatoid arthritis (Table 1.3).

Musculoskeletal complaints are also common causes for disability pensions, along with mental disorders and cardiovascular disorders. The relative importance of these three groups varies, but in several countries, the mental and musculoskeletal disorders are 2-4 times more frequent than cardiovascular disorders as causes for disability pensions. In Norway, low back disorders are the commonest reason (Table 1.4) (51). In 1991, musculoskeletal diseases were the most expensive disease category regarding work absenteeism and disablement in the Netherlands (52). The total costs of back pain to society accounted for 1.7% of the GNP. In Sweden, up to 60% of people on early retirement or longterm sick leave claimed musculoskeletal problems as the reason (47).

Table 1.3 Distribution (%) of persons with sick leave longer than 14 days due to musculoskeletal and connective tissue disorders by diagnosis and gender. Norway, 1994 (50)

Diagnosis	Men N= 75,228	Women N= 81,416	Total N= 156,644
Low back disorders	35%	31%	33%
Neck and shoulder disorders	16%	23%	20%
Musculoskeletal injuries	23%	12%	17%
Tendentious, epicondylitis, ganglion	6%	7%	7%
Rheumatoid arthritis	3%	3%	3%
Osteoarthritis	2%	2%	2%
Muscle pain/fibromyalgia	0.5%	2.4%	1.5%
Other musculoskeletal disorders	15%	19%	17%
Total	100%	100%	100%

Table 1.4 Distribution (%) of persons on disability pensions due to musculoskeletal and connective tissue disorders by diagnosis and gender. Norway 1997 (51)

Diagnosis	Men N= 26,623	Women N= 54,034	Total N= 80,657
Low back disorders	59%	36%	44%
Rheumatoid arthritis	6%	10%	9%
Osteoarthritis	13%	12%	12%
Muscle pain/fibromyalgia	7%	24%	18%
Other musculoskeletal disorders	15%	18%	17%
Total	100%	100%	100%

Utilisation of health and social care services

People with musculoskeletal complaints are frequent visitors to primary health care centres, hospitals, and paramedical institutions (e.g. physiotherapy and chiropractic). Musculoskeletal pain is a common reason for primary care consultation (53) and a major basis for health care costs (54). The associated health care costs that are generated by these musculoskeletal conditions are great. Musculoskeletal conditions were the most expensive disease category in the Swedish cost of illness study, representing 22.6% of the total cost of illness. 90% of these were indirect costs (31.5% sick leave, 59% early retirement) (8) (9). The total costs were attributable to back pain (47%), osteoarthritis (14%) and RA (5.5%). In 1994, musculoskeletal conditions were the second largest diagnostic group after mental retardation to generate

healthcare costs in the Netherlands (11). The total direct cost for health services due to musculoskeletal conditions was 0.7% of the gross national product. This study only considered medical costs and the inclusion of the costs of informal care would have greatly increased the costs related to chronic disabling conditions such as musculoskeletal diseases. The costs were considerable at all ages, ranking fifth at age 15 – 44 years, second at age 45 – 64 years and third age at age 65 – 84 years after dementia and stroke.

In addition to the direct health care costs, disability also generates considerable indirect costs, due to social support in addition to the costs of lost productivity and wage loss. For these reasons the indirect costs of musculoskeletal conditions are much greater than the direct costs.

What is going to happen?

The impact on the individual and society is predicted to increase dramatically. Many of these conditions are more prevalent or have a greater impact in older age and by the year 2050, more than a quarter of Europe's population is predicted to be over 65 years. The number of those

affected by these conditions will increase markedly, in particular those affected by osteoporosis and osteoarthritis. Changes in lifestyle factors such as obesity, smoking and lack of physical activity will also greatly increase the burden of musculoskeletal conditions.

1.2 Osteoarthritis

What is it?



Osteoarthritis is a slowly progressive musculoskeletal disorder that can occur in any joint, but is most common in selected joints of the hand, the spine, and the lower limb weight-bearing joints - the hip, knee and feet. It is the most common joint disorder and accounts for more disability among the elderly than any other disease.

Osteoarthritis is characterised by changes to the structure of the entire joint. There are focal areas of fibrillation, fissures, ulceration and full thickness loss of articular cartilage within synovial joints, associated with hypertrophy of bone (osteophytes and subchondral bone sclerosis) and thickening of the capsule. In this sense it is the reaction of synovial joints to injury. This pathological change, when severe, results in radiological changes.

Osteoarthritis can be identified radiologically by these changes of loss of joint space, subchondral sclerosis, bony cysts and osteophytes. These radiological changes can be graded, usually by Kellgren & Lawrence scores. A Kellgren & Lawrence score of 2-4 is the most widely used definition of radiological osteoarthritis in epidemiological studies.

Clinically it is characterised by joint pain, crepitus, and stiffness after immobility and limitation of movement.

Radiographic changes are not always accompanied by symptoms of pain, stiffness or loss of function, and conversely joint pain is not always associated with radiological abnormalities. The preferred definition for knee osteoarthritis includes both x-ray findings and the presence of joint pain on most days (55). Clinical criteria have been developed for the hand, hip and knee (55-57) that include pain as an obligatory symptom but these criteria are seldom used in epidemiological studies.

Many cases are 'idiopathic' (disease or condition of unknown cause or which arises spontaneously) but

osteoarthritis can also be the end result of several other conditions or due to the combination of several other factors. Some of these factors include age; joint damage by injury; heredity; abnormal joint mechanics and other types of joint disease. There is a developing knowledge in the cell biology and biochemistry of the joint cartilage that are beginning to shift the view of the pathophysiological process of osteoarthritis. New imaging methods (MRI, scintigraphy, ultrasound), arthroscopy and biochemical markers of bone and cartilage turnover might be useful in the future (58).

How common is it?

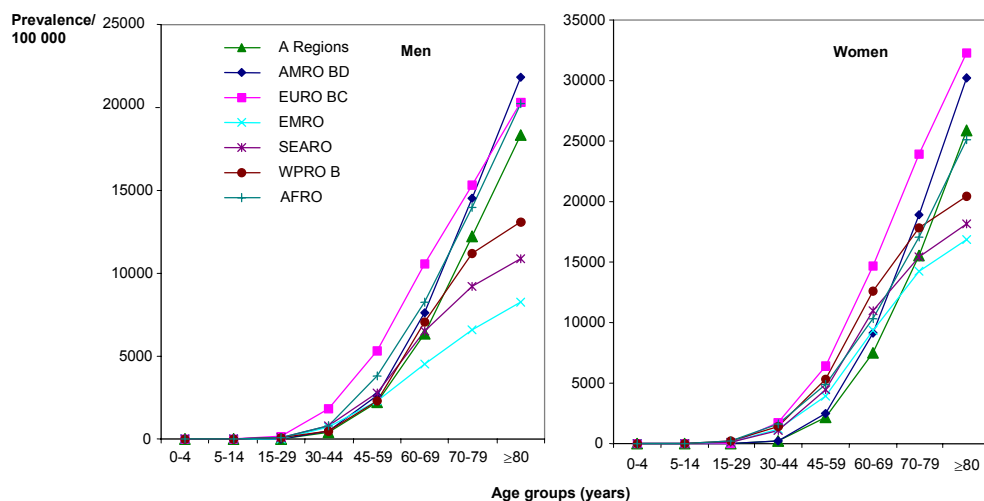
Most attempts to estimate the prevalence of osteoarthritis are based on radiographic surveys of populations. Radiographs will only detect those with severe osteoarthritis pathology and tell us little about the patients' symptoms or disability. The prevalence of osteoarthritis increases indefinitely with age, because the condition is not at present reversible. These surveys show that osteoarthritis changes are uncommon in those under the age of 40 but are seen in most over the age of 70. For example, in people age 55 – 74 the prevalence of OA of the hand is 70%, foot OA 40%, knee OA 10% and hip OA 3%. Men are affected more often than women among those aged <45 years, whereas women are affected more frequently among those aged >45 years (58).

There have been some attempts to estimate the number of people who might have significant clinical problems arising from osteoarthritis joint pathology. It is estimated, from surveys mostly confined to developed countries, that 1 in 10 of the population who are 60 years or older have significant clinical problems that can be attributed to osteoarthritis.

The incidence of osteoarthritis is difficult to estimate due to the problems with definition. Incidence of osteoarthritis is highest in the 65-74 age bracket for females, reaching approximately 13.5 per 1000 population. The incidence of osteoarthritis in males is highest in the 75+ age bracket, where approximately 9 new cases per population occur each year.

Figure 1.7. Prevalence of osteoarthritis of the knee by age group, sex, and broad regions, 2000 (19)

A regions = developed countries in North American, Western Europe, Japan, Australia, and new Zealand. AMRO BD = developing countries in the Americas. EURO BC = developing countries in Europe. EMRO = countries in the Eastern Mediterranean and North African regions. SEARO = countries in Southeast Asia. AFRO = countries in sub-Saharan Africa.

**Table 1.5 Prevalence and incidence of osteoarthritis from various studies across Europe (59)**

Country	Disease	Sample Size	Sample Type	Classification Criteria used	Years	Age Group	Group	Prev'ce%
Iceland	Hip	1520	Population	Kellgren and Lawrence >2	1998	≥35	Men	12
							Women	10
Netherlands	Hip	6585	Population	Kellgren and Lawrence 2-3	1975-78	≥45	Both	7.17
	Knee							17.36
Sweden	Knee	1852	Population based postal survey in a random sample	Kellgren and Lawrence >2	1995/6	35-54	Both	1
UK	Knee	1000	Population	Kellgren and Lawrence >2	1992	45-64	Women	12
	General							2.2
Spain	Hand	2055	Polystage random sample	American College of Rheumatology	2000	≥20	Both	6.2
	Knee	1970						10.2
Iceland	Hand	150	Population	American College of Rheumatology	1994/5	59-101	Men	3.3
		97				62-103	Women	6.8
Greece	Peripheral and Spinal	8740	Population Based	American College of Rheumatology		≥19	Men	8

What is the impact on the individual?

At present osteoarthritis is not reversible. The course of osteoarthritis varies but is often progressive and the radiographic changes of osteoarthritis inexorably progress, albeit at a slow rate, in the hands (60), the knees (61), and the hips (62). This leads to increased pain and progressive disability (61). Progression of osteoarthritis is accelerated by age and in the hip and knee by obesity and intensive physical activity.

The impact of osteoarthritis to individuals relates to pain, loss of motion of affected joints, which limits activities such as manual dexterity and mobility. It is the major contributor to lower limb disability. It affects independence and psychosocial functioning, and in addition leads to financial losses. Its impact can be described by the health state descriptions that have been developed as part of the GBD 2000 project (Table 1.6).

Osteoarthritis of the hip and knee are the most important from the viewpoint of public health, based on their prevalence and associated disability. Osteoarthritis of the knee is a major cause of mobility impairment, particularly

among females. Osteoarthritis was estimated to be the 10th leading cause of non-fatal burden in the world in 1990, accounting for 2.8% of total Years Lost to Disability (YLD), around the same percentage as schizophrenia and congenital anomalies (63). In the Version 1 estimates for the Global Burden of Disease 2000 study, published in the World Health Report 2001 (64), osteoarthritis is the 6th leading cause of YLDs at global level, accounting for 3.0% of total global YLDs.

In surveys of adults with musculoskeletal problems, most of whom have osteoarthritis, over 60% reported some form of activity limitation (65) and almost 40% of those with osteoarthritis reported that they need assistance from friends and relatives with daily tasks. Another 38% reported adverse effects on their family relationships, 27% needed changes to their living arrangements, 23% stated they needed special transport arrangements and 26% reported that osteoarthritis had influenced their paid employment (66).

Table 1.6 Health state descriptions for osteoarthritis (67)

Health State Descriptions for Osteoarthritis	
Sequela/stage/severity level	Health state description
Osteoarthritis of the hip Grade 2 symptomatic	Definite osteophytes and possible narrowing of joint spaces. Hip pain on most days. Availability of treatment (pain medication, anti-inflammatories) may result in reduced pain and disability.
Osteoarthritis of the hip Grade 3-4 symptomatic	Marked narrowing of joint spaces, definite osteophytes and deformity of femoral head. Hip pain on most days. Availability of treatment (pain medication, anti-inflammatories) may result in reduced pain and disability. Joint replacement likely in developed countries for Grade 4+ with significant disability (model this as reduction in prevalence of Grade 3-4 rather than reduced disability weight).
Osteoarthritis of the knee Grade 2 symptomatic	Possible narrowing of joint spaces and definite osteophytes. Knee pain on most days, tenderness, morning stiffness and crepitus on active joint motion. Availability of treatment (pain medication, anti-inflammatories) may result in reduced pain and disability. Around 8% of symptomatic cases with grade 2+ osteoarthritis need assistance with stair climbing (compared to 2% of non-cases in Framingham study), 30% not able to walk a mile (compared to 14% non-cases), 11% needed assistance with housekeeping (cf. 6%).
Osteoarthritis of the knee Grade 3-4 symptomatic	Definite or marked narrowing of joint spaces, multiple moderate to large osteophytes, and possible to definite deformity of bone ends. Knee pain on most days, tenderness, morning stiffness and crepitus on active joint motion. Availability of treatment (pain medication, anti-inflammatories) may result in reduced pain and disability. Joint replacement may occur in developed countries for Grade 4+ with significant disability (model as reduction in prevalence).

What is the impact on society?

Work disability

Although many people with osteoarthritis are not in the workforce due to their age rather than their disease, there have been some studies that showed that the work-related disability rate with osteoarthritis varied from 30 to 50%. In addition the same study showed that extensive

workdays were also lost due to osteoarthritis (68). Those with osteoarthritis are more likely to report reduction in working hours or inability to get a job due to their illness (69). It is also a cause of early retirement.

Utilisation of health and social care services

Osteoarthritis is one of the most common forms of musculoskeletal disorders and incurs significant economic, social and psychological costs. Of the studies which have been undertaken in the USA, Canada, the UK, France and Australia it has been estimated that the costs of the illness have risen over recent decades to now account for up to 1-2.5% of GNP (70).

The Australian Institute of Health and Welfare has estimated that total health system costs of osteoarthritis in Australia were \$624 million AUD in 1993-94 which is approximately 21% of total expenditure on musculoskeletal disorders. 12.8% of total costs were contained within medical services (GPs and specialists) and approximately 9% contained within Pharmaceutical expenditure. \$35.9 million was spent within the field of allied health on osteoarthritis (5.8%), very close to the total expenditure on osteoarthritis in general practice (\$35.8million). Of note, less than 1% of total expenditure on osteoarthritis was spent on research (\$5.4million).

In the UK in 1986, it was estimated that the direct costs of arthritis in the UK (including hospital costs, GP costs and prescriptions) amounted to £1 billion (21). The

Calderdale Survey found that 9% of those reporting joint problems used regular medications and 10% had seen a specialist. Of those with associated disability, 84% required primary health care and 52% utilised hospital and rehabilitation services (71).

The total medical costs for those with osteoarthritis under 65 years are double compared to similar individuals without osteoarthritis and 50% higher in those over 65 years (72). Costs relate to drugs including those to counteract gastrointestinal side effects of NSAIDs and admission usually related to arthroplasty. Rehabilitation is important and as many as 55% of patients admitted for care in a rheumatology unit was related to osteoarthritis. Differences in use of more demanding health resources, such as joint replacement surgery, varies in different countries but this variation probably more reflect the ability to supply surgery than a difference in impact of disease. Total hip replacement rates in OECD countries vary between 50 and 140 procedures / 100,000 (73). The main reason for this procedure is osteoarthritis.

The average cost of hip replacement in the UK in 2002 was £4,356 (€ 6,487) for NHS hospitals.

What is going to happen?

Osteoarthritis increases in prevalence and also progresses with aging. The aging of the population will significantly increase the burden due to osteoarthritis. Obesity is increasing and is associated with the development and progression of osteoarthritis. There is a growing knowledge in the cell biology and biochemistry of the cartilage that could give new treatment possibilities in the

future. Biochemical markers and new imaging techniques might in the future identify people at risk or in earlier stages of the disease and allow for an early intervention. More knowledge is however needed and the potential reduction on the burden of osteoarthritis on individuals and society is still to be shown.

1.3. Rheumatoid Arthritis

What is it?



Rheumatoid arthritis is the most common inflammatory disease of the joints. It usually presents with pain, stiffness and symmetrical swelling of the small joints of the hands and feet but may also any other synovial joint. Symptoms of fatigue, weight loss and malaise can occur as well. There can be systemic involvement such as vasculitis. It is usually progressive affecting further joints and the destructive disease process causes irreversible bony erosions and the joints become structurally deformed, with longterm pain and disability.

The definition of rheumatoid arthritis (RA) that is used in epidemiological studies has changed over time. Currently, the preferred definition is the classification suggested by the ACR (American College of Rheumatology) (74). Presentation may be as an inflammatory arthritis that with time in some progresses to meet the diagnostic criteria for rheumatoid arthritis (75). The time when a sufficient number of criteria are reached should be considered the onset of RA. The criteria include the presence of morning stiffness, arthritis of more than one joint, symmetrical arthritis, rheumatoid nodules, positive blood test for rheumatoid factor and bony erosions on X ray. In contrast,

there is no universal definition of childhood arthritis on account of its less defined clinical pattern. The three common definitions are those developed by the ACR, the European League of Associations for Rheumatology (EULAR) and, most recently, the International League of Associations for Rheumatology (ILAR) (76). They differ in nomenclature and have different inclusion and exclusion demands. Each describes a somewhat different group of patients. The ILAR criteria seek to describe homogeneous groups of patients in a manner that is internationally agreed upon.

How common is it?

The incidence of RA is estimated from 4–13 per 100,000 for adult males and 13–36 per 100,000 for adult females. Estimates of the prevalence of RA range from 1-6 per 1000 for men and 3-12 per 1000 for women (Table 1.7).

In all studies the prevalence was higher in women than men, the ratio varying from 1.7 to 4.0. Peak age of onset is between 35 and 45 years.

Table 1.7 The prevalence of rheumatoid arthritis reported in a selection of studies from Europe during the past 10 years.

Country	Year	Author	Criteria	Age	N	Prevalence
England	1994	MacGregor (77)	Modified ARA	18-	3680	0.3-0.8%
Norway	1997	Kvien (78)	1987 ARA	20-79	356486	0.44%
Greece	1997	Drosos (79)	1987 ARA	16-	128916	0.34%
Italy	1998	Cimmino (80)	1987 ARA	16-	3294	0.33%
France	1999	Saraux (81)	1987 ARA	18-	2873	0.62%
Ireland	1999	Power (82)	1987 ARA	18-	1227	0.5%
Spain	2000	Carmona (83)	1987 ARA	20-	2190	0.5%
Sweden	1999	Simonsson (84)	Modified ARA	20-74	3928	0.5%

What is the impact on the individual?

Rheumatoid arthritis has a significant impact on patients' physical, emotional and social functioning that often occurs very early in the disease with the onset of symptoms. The diagnosis itself can cause a variety of reactions such as disbelief, anger and fear. There is also a high incidence of psychological stress during the early stages of RA which persists into established RA which is attributed to symptoms such as pain, fatigue and disability as well as fear of disability.

Even in its early stages RA can have a significant impact on patients' ability to carry out their activities of daily living, work and leisure. Health status is significantly impaired from onset as measured by generic instruments (SF36, Euroqol 5D) or disease specific instruments (HAQ). Within 2 years of onset (85-87) the HAQ score

was between 0.8 and 1.04 out of a maximum of 3.0, with greatest impact on physical function.

Disability rises in a linearly with disease duration. In one study (88) 822 RA sufferers were studied prospectively compared to controls with regards to their functional status. Over 5 years the RA group suffered about 10% further loss of activity compared to the controls. The areas particularly affected were work – related, child care and leisure activities. RA sufferers were found to go out less and had difficulty getting into buses and cars. Within 10 years at least 50% of patients have been reported as unable to hold down a full-time job (89). Those whose disease starts early, before the age of 45 years, are more likely to become severely disabled.

What is the impact on society?

Work disability

RA has an early impact on patients' ability to work and their socio-economic status.

Days lost from work by those in employment vary in studies from 2.7 to 30 days per annum (90). Employment is 20% lower in men and 25% in women with arthritis compared to those without (91). Work capacity is restricted in a third within 1 year (92) and within 3 years about 40% will be registered work disabled (93). In the USA patients with rheumatoid arthritis were found to

lose their jobs, unable to get a job or retired early due to their illness (69). Those who do work will have often adjusted their work with loss of potential income, and work-related disability is greatest in those doing manual jobs. Loss of activity days is substantial, with people reporting 2-3 days of restricted activity within the previous 2 weeks (94). Predictors of work disability include increasing age, the severity of the disease measured by the number of damaged or deformed joints, greater work complexity and a desire not to work outside the home (95).

Utilisation of health and social care services

The direct costs relate to hospital and primary care medical consultations to assess disease activity and to monitor treatment for safety and efficacy, drug costs, rehabilitation and provision of equipment. Arthroplasty may be required. Indirect costs relate to loss of employment by the patient and often by the carer. Importantly many people with rheumatoid arthritis or their carers do not have the employment opportunities they would have with a consequent loss of productivity and income. The intangible costs of RA are great but difficult to quantify. Various studies have looked at the considerable health and social costs but differences are difficult to interpret and largely relate to different severity of disease and disability, different health and social systems that influence access and variations in data sources and types of costs described. As a consequence it is impossible to give an average cost.

The direct and indirect costs of illness are twice as high in people with rheumatoid arthritis compared to controls (96) but two thirds relate to comorbidities, although this in part could reflect rules for reimbursement of care for people with RA. In a systematic review of 15 cost-of-illness studies (97) it was found that the average direct annual costs were US\$ 5720 per person with rheumatoid arthritis. They are initially high and then usually stabilise to a lower level until joint damage progresses and arthroplasty becomes necessary. A small proportion of patients are responsible for the majority of direct costs (97) and they were highest for a younger population, short duration and greatest disease severity. Inpatient care strongly influenced these costs and admission rates varies across Europe. In France RA patients use health resources more frequently, more intensively and in a more diverse manner than non-arthritis subjects in France (98) and 5.1% of all patients had RA related surgery in the previous year. In a

10 year follow-up of patients with early rheumatoid arthritis, 17% had undergone large joint replacements (99). The costs of medication are less than 20% of direct costs (100) but this was before the introduction of anti-TNF, but this will now have changed with its increasingly widespread use.

The indirect costs are typically between 50 and 75% of the total in developed countries. They are strongly influenced by loss of work, either short or longterm. Rheumatoid

arthritis also has a considerable impact on all aspects of quality of life and almost two thirds in a cohort study had restriction of activities of daily living and required help from family or friends with an adverse effect in many cases on family relations (101).

The costs of side effects related to treatment must be considered, such as fractures subsequent to steroid-induced osteoporosis, or drugs, hospitalisations and deaths from NSAID-gastropathy (102).

What is going to happen?

The incidence of RA fell between the 1960's and 1980's and this is now reflected in a fall in the prevalence in women aged 16-74 years in data from the UK. The reason is unclear. There have been major advances in the treatment of RA in the last 20 years, in particular over the

last 5 years with the introduction of biological therapies and the longterm outcome of the disease has improved and continues to do so. The socioeconomic impact should also reduce.

1.4 Back pain

What is it?



Low back pain is a major health and socioeconomic problem across Europe. The majority of back pain is due to non-specific causes, that is there is no known underlying pathology. It is usually defined as pain localised below the 12th rib and above the inferior gluteal folds, with or without leg pain.

Non-specific back pain is usually classified as acute (less than 6 weeks) or subacute (up to 3 months) if they occur suddenly after a prolonged period without pain (6 months) and with a retrospective duration of less than 3 months. Non-specific back pain is classified as chronic if it occurs episodically within a 6-month period or with duration of more than 3 months.

There are several specific causes of back pain which can be defined by the cause and need to be looked for such as **degenerative conditions** (e.g. herniated disc disease, spinal stenosis and degeneration of facet joints); **inflammatory conditions** (e.g. ankylosing spondylitis); **infective causes** (e.g. osteomyelitis); **neoplastic causes** (e.g. metastases, primary benign or malignant tumours); **metabolic bone disease** (e.g. vertebral fracture related to osteoporosis); **referred pain** (e.g. from duodenal ulcer); **psychogenic pain** (originating in the mind rather than the body); **trauma** (e.g. fractures) and **congenital** (e.g. severe scoliosis, spina bifida). The prevention and management of specific back pain is not considered in this document.

How common is it?

The prevalence of non-specific back pain has been obtained from studies performed in the USA and Europe and been reviewed by Andersson 1997 (Table 1.8) (103); Loney 1999 (104); Walker 2000 (105).

It is estimated that 12-30% of adults have low back pain at any time and the lifetime prevalence in industrialised countries varies between 60% and 85%.

The population based data on back pain have been collected primarily in North America and Europe (106) and this data may be subject to social, economic, genetic and environmental variables in addition to issues of study technique and back pain definition.

It is a difficult task to define and identify more significant and severe episodes since their relevance may only be assessed retrospectively and retrospective reports of back pain may not be reliable. Also, epidemiological data

reported in the literature usually has been collected in different populations. Lumping together data from open populations (e.g., the general population) and closed populations (e.g., general practice patients) is not very useful and incidence and prevalence data need to be reported for specific populations. Only few studies have reported incidence data (107).

Epidemiological data for spinal disorders in general is often reported as low back pain regardless of the diagnosis or cause which makes it difficult to make accurate assessments of the incidence of specific or non-specific back pain. The prevalence of specific causes is estimated in most industrialised countries as ranging between 2% and 8% and therefore much lower than the prevalence of non-specific back pain.

What is the impact on the individual?

Most episodes of low back pain settle after a couple of weeks and most individuals will return to work within 1 week with 90% returning within 2 months. After 6 months of work, less than 50% will return to work and after 2 years absence, there is little chance of returning to work (108). Many have a recurrent course with further acute episodes affecting 20-44% of patients within one year in the working population and lifetime recurrences of up to 85% (109).

A substantial proportion of individuals with chronic low back pain has in population studies been found to have

chronic widespread pain (15;17). It has also been shown that the presence of widespread pain is associated with a worse prognosis for those with low back pain (110). It has been suggested that the large proportion of individuals with low back pain as part of a more widespread pain syndrome may be responsible for the major burden that chronic non-specific low back pain has on individuals and society (107).

Back pain can cause loss of health status in the form of symptoms and loss of function, limitation of activities and restricted participation. Loss of function relates to pain in the back and associated distress and behavioural problems.

Limited activities include those of daily living, leisure activities and strenuous activities. There may be temporary or permanent work disability, chronic pain

behaviour and dependence/care needs from others. Fear of the recurrence of back pain can also limit activities and restrict participation.

Table 1.8 The prevalence of back pain in cross sectional studies

Prevalence of Low Back Pain in Cross-Sectional Studies						
Study	Prevalence (%)			Study population		
	Lifetime	Point	Period	Number	Age (years)	Sex (M/F)
Biering-Sørensen	62.6	12.0	-	449	30-60	M
Biering-Sørensen	61.4		-	479	30-60	F
Frymoyer	69.9		-	1221	28-55	M
Gyntelberg	-		25	-	40-59	M
Hirsch	48.8		-	692	15-72	F
Hult	60.0		-	1193	28-59	M
Magora	-		-	3316	-	M, F
Nagi	-		-	1135	18-64	M, F
Papageorgiou	59.0		35	1884	>18	M
Papageorgiou	59.0		42	2617	>18	F
Svensson	61		31	716	40-47	M
Svensson	67		35	1640	38-64	F
Valkenburg	51.4		-	3091	>20	M
Valkenburg	57.8		-	3493	>20	F
Walsh	58.3		36	2667	20-59	M, F

Source: Reprinted, with permission from Andersson (1997) where full details of the studies included can be found.
(103)

What is the impact on society?

Back pain poses an economic burden to society mainly in terms of the large number of work days lost by a small group of patients who develop chronic low back pain.

The costs to society for taking care of people with low back pain are measured by looking at the resources that are sacrificed e.g. work days, healthcare intervention, and costing these resources. Most studies conducted have concluded that the small percentage of patients with chronic low back pain who have symptoms for more than 3 months account for the largest percentage of costs. One study in the USA showed that 4.6% to 8.8% of cases of back pain lasted for more than one year but accounted for 64.2% to 84.7% of the costs (111).

In the USA an analysis of 30 074 people in the 1988 Health Interview Survey showed that low back pain was estimated to account for 149 million lost work days annually while work-related low back pain was estimated to cause the loss of 101.8 million workdays.

The annual costs of lost work time associated with chronic low back pain were estimated to amount to \$1,230 for men and \$773 for women based on data from the 1987 U.S.A. National Medical Care Expenditure Survey. This translated into annual productivity losses of \$28 billion.

A cost-of-illness study of low back pain in the UK estimated that the 1998 direct costs of low back pain were £1.6 billion and that the overall costs varies between £6.6 billion and £12.3 billion depending on the costing method used (112).

Table 1.9 The cost of back pain in the UK, Sweden and the Netherlands

Costs of back pain in the UK, Sweden and the Netherlands (in US\$)						
Costs	United Kingdom		Sweden		Netherlands	
	Costs in US \$ million (% of total)	Costs/capita	Costs in US \$ million (% of total)	Costs/capita	Costs in US \$ million (% of total)	Costs/capita
Direct costs	385 (11.5)	7	213 (8)	24	368 (7.4)	24
Indirect costs	2948 (88.5)	113	2262 (92)	266	4600 (92.6)	299
Total costs	3333 (100)	120	2475 (100)	290	4968 (100)	323

Source: Moffett et al (1995) (113)

What is going to happen?

The prevalence and incidence of low back pain appears to be moderately increasing, with a greater increase in the functional consequences, especially work disability. Systems of social support may also affect the chronicity of the problem in some cases. The increases may also be influenced by the aging of the population along with a high rate of obesity and a sedentary lifestyle. Low back

pain will therefore continue to be a major problem for individuals and society. Prevention is therefore important and there is theoretically a potential for reduction of the problem but there is a need for studies on the effect of different interventions for primary (reducing occurrence) and secondary (reducing chronicity) prevention.

1.5 Osteoporosis

What is it?



Osteoporosis is a disease in which the density and quality of bone are reduced, leading to weakness of the skeleton and increased risk of fracture, particularly of the spine, wrist, hip, pelvis and upper arm. Osteoporosis and associated fractures are an important cause of mortality and morbidity.

Osteoporosis is defined as a systemic skeletal disease characterised by low bone mass and microarchitectural deterioration of bone tissue, with a consequent increase in bone fragility and susceptibility to fracture. In 1994, an expert panel convened by the World Health Organisation (WHO 1994) (114) adopted this concept by defining diagnostic criteria for osteoporosis based on measurement of bone mineral density (BMD):

- **Osteoporosis:** a BMD value more than – 2.5 standard deviations (SD) below the mean BMD of young adult women (BMD T-score < -2.5).
- **Established Osteoporosis:** a BMD value T score < -2.5 and the presence of one or more fragility fractures.
- **Osteopenia (low bone mass):** A BMD value between –1 and –2.5 SD below the mean BMD of young adult women (-2.5 < BMD T-score < -1).

Fracture probability is also influenced by other factors relating to bone strength such as macro- and micro-structure and bone turnover, and factors related to trauma, such as risk of falls.

Clinically, osteoporosis is recognised by the occurrence of characteristic low trauma fractures; the best documented of these are hip, vertebral and distal forearm fractures. Low

bone density itself does not cause pain or deformity; its importance lies in the fact that it greatly increases the risk of fracture, notably forearm, hip and vertebral fracture. After the age of fifty the risk of sustaining one of these fractures is 40% in women and 15% in men. This is termed the ‘lifetime fracture risk’.

Clinical consequences of osteoporosis include:

Increased mortality – mortality is increased by 20% in the first year after a hip fracture and also after vertebral fracture, possibly as a result of diseases that increase the risk of fractures and death.

Pain – either as a direct result of the fracture or later from secondary osteoarthritis.

Deformities – which include kyphosis, loss of height and abdominal protrusion.

How common is it?

The incidence of osteoporosis is best measured as the incidence of fractures that are the consequences of osteoporosis.

In western populations, hip fracture incidence rates increase exponentially with age. Above 50 years of age there is a female to male incidence ratio of approximately 3:1. Overall about 98% of hip fractures occur among people aged 35 years or older and 80% occur in women due to the fact that there are more elderly women than men.

In the member states of the European Community there were an estimated 414,000 hip fractures in 2000, about 326,000 in women and 88,1000 in men (115).

Incidence rates for morphometric vertebral deformities have been obtained through the European prospective Osteoporosis study (EPOS.) The incidence of new vertebral deformities was estimated from radiographs at baseline and at 4 year follow-up in these subjects. Overall, age and sex- adjusted incidence rates were 1% per year among women and 0.6% per year among men.

Distal forearm fractures display a different pattern of incidence rates. Studies from northern USA around 10 years ago suggested that rates increased linearly among women between the ages of 40 and 65 years; thereafter rates appeared to plateau. Among men, incidence rates remained constant between the ages of 20 and 80 years. As a consequence, most distal forearm fractures occur in

women at an age-adjusted ratio of 4:1 and around 50% occur in women aged 65 years and older. More recent studies of distal forearm fracture epidemiology in the UK have reported an annual incidence of 9 per 10 000 among men and 37 per 10 000 among women (116).

The incidence of fractured neck of femur (as measured by hospital discharge diagnosis) in Europe shows a sharp gradient from north (Sweden - highest) to south (Spain - lowest). There is an almost seven-fold difference in the incidence between these two countries. There is also a clear difference between countries for vertebral deformities. Again the highest rates are in the Scandinavian countries. However this does not follow such a clear north-south gradient and there are likely to be

other differences in life-style and health which underlie this pattern.

Specific data on the prevalence of osteoporosis using the WHO definition have been obtained in North American, European and Australian populations (36). In the northern USA an estimated 54% of postmenopausal women have osteopenia and a further 30% have osteoporosis at least one skeletal site. 51% of osteoporotic women and 16% of all white women aged 50 years or above are estimated to have established osteoporosis. In the UK it is estimated that around 23% of women aged 50 years and above have osteoporosis according to the WHO criteria. This proportion increases steeply from age 50 to age 80 years.

Figure 1.8 Incidence of osteoporotic fractures in women (117)

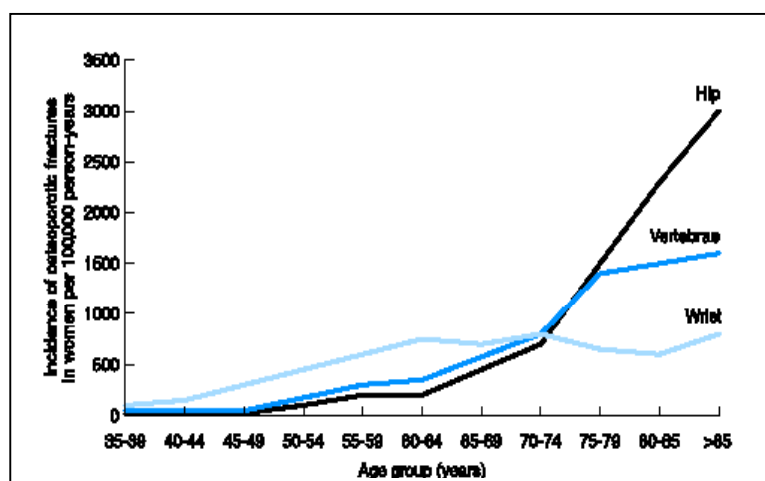


Table 1.10 The lifetime and 10 year probability of a future fracture for men and women at different ages (Adapted from Van Staa et al (2001) (118))

Current age (years)		50	60	70	80
Lifetime risk of any fractures (%)	Men	20.7	14.7	11.4	9.6
	Women	53.2	45.5	36.9	28.6
10 year risk of any fractures (%)	Men	7.1	5.7	6.2	8.0
	Women	9.8	13.3	17.0	21.7

What is the impact on the individual?

Osteoporotic fractures can cause varying degrees of mortality and morbidity. They also have a significant impact on quality of life.

The mortality attributable to osteoporosis results largely from hip fractures. Hip fracture causes a 12 to 20% reduction in expected survival (119). Up to one third of hip fracture patients become totally dependent and some

permanently disabled, necessitating institutionalisation (120).

The morbidity caused by vertebral fractures varies with the frequency of such fractures. Multiple fractures typically cause the most pain and disability (121). Quality of life studies show an increasing impact on quality of life with an increasing number of vertebral fractures (122).

What is the impact on society?

Although it is recognised that osteoporotic fractures represent a significant burden of morbidity to society the economic burden is equally high. Studies in various countries have shown that the costs of osteoporosis are very substantial. It is estimated that osteoporosis now costs more than Euro 4.8 billion annually in hospital healthcare costs alone (excluding rehabilitation and nursing home costs); a 33% increase over three years from 1996 to 2000. Hip fracture is a major cause of hospital admission in the elderly and the acute care costs are substantial. In the UK the direct cost for hip fractures was £942 million per year in 1998 (123). This has recently been updated and estimated to cost £1.65 billion per year.

In Europe, the total costs of caring for people in the first year after a hip fracture is estimated at 14.7 billion Euro (115), and the scale of costs is similar in the USA. (124).

In the USA the average nursing home care cost for each hip fracture patient was as much as \$3875 in 1995 (118). This approximated to 28% of the total cost for hip fracture. Since death due to hip fracture occurs mainly in the elderly, the indirect cost due to reduced productivity is much lower than that for other chronic disorders such as ischaemic heart disease or breast cancer. However the direct cost is comparable.

What is going to happen?

In the three decades up to 1983, the age-specific incidence rates of hip fracture doubled for those aged over 65 (125). The reason for this change in incidence is not known. One possible explanation may be the lower amount of physical activity undertaken by present-day women. Recent analysis from the UK (126) indicates an increase in age-sex standardised admission rates for hip fracture rates between 1978-81 and 1993-95 (from 190 to 263 per 100,000 per year for men and from 570 to 770 per 100,000 per year for women). Kanis has argued that, if current trends continue, the number of hip fractures

occurring each year will more than double during the 20-year period following 1993 (127). In the then member states, it was estimated that the annual incidence of hip fracture would increase from 414,000 to 972,000 over the next 50 years (115). The impact of osteoporotic fractures is also set to rise in the future because of the ageing population. Hip fractures occur more frequently in the winter months. However, the majority of hip fractures occur indoors. Colles' fractures are also more common in the winter months but they occur more often following falls outdoors.

1.5 Musculoskeletal Trauma & Injuries

There is a wide spectrum of trauma and injuries that affect the musculoskeletal system in terms of the cause, the structural damage and the outcome. For the purposes of this report, musculoskeletal trauma and injuries will be considered in the context of (a) major limb trauma, (b) occupational and (c) sports injuries.

Major limb trauma

What is it?

The following operational definition of major limb trauma has been adopted for this report: *Major limb trauma consists of all acute injuries and burns to the upper and lower extremities, excluding sprains and strains and superficial injuries such as minor lacerations and contusions.* This definition includes: all fractures, dislocations, crushing injuries, open wounds, amputations,

burns, and neurovascular injuries to the extremities. Injuries resulting from all mechanisms (including both intentional as well as unintentional injuries) are included in the definition. Lower extremity trauma (LET) includes injuries to the pelvis (and distal) and upper extremity trauma (UET) includes all injuries to the shoulder (and distal).

How common is it?

Major limb trauma is common across Europe with, for example, about 9 million people in Germany have an accident each year (11.0% of the German population) (128;129). Injuries of the upper and lower limb are found in more than 70% of all accidents. The incidence of trauma to the extremity depends on several factors, like sex, age and the cause of accident. The highest incidence of major limb trauma is related to sports (83%). The upper extremities are more often affected due to accidents at home, whereas the lower limb is injured by sport accidents (129). Fractures are caused by falls (total 43%; men 59%; women 33%), external violence (total 40%;

men 47%; women 29%) and sports activities (total 15%; men 18%; women 10%) (130).

1.6 million of all injured individuals in Germany needed hospital care in 2000. Major trauma of the upper and lower extremities were very common injuries in these trauma victims (Table 1.11). The highest incidence of extremity fractures that were treated in hospital was found in geriatric patients (45%). Overall, in 41% of injured individuals, major limb trauma was the cause for hospital treatment (129).

Adults

In a Welsh population based study, a total of 6467 fractures of any type were identified among the 306.600 people who live in a Welsh city over a single year. This gives an overall fracture incidence of 21.1/1000/year, 23.5/1000/year in males and 18.8/1000/year in females. These results were found to be very similar to those from previous studies in the USA, Australia and Norway (131).

In a Turkish cross-sectional study, 418 out of 2461 students had had a fracture in their live (132).

The incidence of fractures is related to age and sex, as demonstrated in a Scottish population (133). Between 15 and 49 years, males were 2.9 times more likely to sustain a fracture than females. Over the age of 50 years, females were 2.3 times more likely to sustain a fracture than males (133).

Table 1.11 Trauma patients with major limb trauma who needed hospital care in Germany (2000) (123)

Major Limb Trauma			
	Number needing hospital care		
	Male	Female	Total
Fracture of the upper extremity	104.411	122.158	226.000
Fracture of the lower extremity	138.780	195.617	334.000
Luxation	33.843	23.294	57.100
Open wound of the upper extremity	25.351	7.313	32.600
Open wound of the lower extremity	11.188	7.313	17.500

These results were confirmed by diverse other studies (118;130;133;134).

A German study (130) analysed age and sex specific frequencies of peripheral fractures. The study comprised 4854 persons, aged between 25 and 74 years (2404 men, 2450 female). The age-standardised fracture prevalence among men was 45% and among women 31% (age 25-74 years). Fracture prevalence among women was more than 10% lower than among men in the younger age groups (age 25-64 years), but after a significant increase in the 65 to 74 year old participants, the fracture prevalence corresponded to that of men (about 40% in males and females). Peaks of incidence rates were found among men at age 15-24 years and 45-54 years. Among women highest incidence rate was found at age 65-74 years. The highest incidence rate for women (65-74 years) were observed for fractures of the distal radius and the lower limb. In men, aged between 15- and 24 years, highest incidence rates were found for fractures of the hand and for the lower limb (130).

A study using data of the AO Research Institute demonstrated a larger prevalence of fractures of the distal femur either in young men and in old women. Traffic and sport accidents represent the major causes in young men, whereas falls at home and osteoporosis are frequent reasons in older women (135).

Records from a database including English and Welsh patients also derive age and gender specific fracture incidence rates during a ten year period. 222.369 patients

(103.052 men and 11.317 women) in a sample of 5.000.000 adults sustained a fracture (4.5% of all adults) (118). Fracture sites differed among males and females and young and older patients. Among women, the most frequent fracture sites were radius/ulna (30.2 cases per 10.000 patient years) and femur/hip (17.0 cases per 10.000 patient years). In men, the most common fracture was that of the carpal bones (26.2 per 10.000 patient years), the incidence of femur/hip fracture was 5.3 per 10.000 patient years. Varying fracture incidences were observed with increasing age. Body regions that were more affected by fractures in geriatric patients were the vertebra, distal forearm, proximal humerus, chest and pelvis. Others were more frequent in younger patients (tibia, fibula, carpus, foot, ankle). The lifetime risk of any fracture was 53.2% at age 50 years among women and 20.7% at the same age among men. Fractures result in the use of health care resources.

In the Scottish study (133), over a two year period about 15.000 adults sustained a fracture (48.5% males; 51.5% females) of whom 34% of these patients required admission (127). In the Welsh population study about 19% of adults with fractures were admitted. Compared for different age groups, 12% of those under 65 years, but 47% of older patients required admission (136).

Fractures of the proximal femur and vertebral bodies were associated with a high mortality rate in men and women, whereas fractures of the distal forearm were associated with only a slight mortality rate over a five year period following fracture diagnosis (118).

Children:

Fractures constitute 10-25% of all paediatric injuries in Swedish studies and are more common in boys than in girls (137;138). Fractures after age 13 years are twice as common compared to children under 13 years. The child's risk of sustaining a trauma is 42% in boys and 27% in

girls from birth to age 16 years. The annual fracture incidence was 235/10.000 in boys and 149/10.000 in girls and 193/10.000 for both genders. Fractures of the distal end of the radius (26%) are the most common injury, followed by fractures of the hand (16%). Playing, sports and traffic,

in that order contributed to 24, 21 and 12 percent of those fractures (137-139).

In Norway, 128 per 10.000 children sustained fractures annually. The incidence increased linearly with age by 14 cases per 10.000 children year for each year of age. Arm fractures represented 66% of the cases, leg fractures 19% of the cases (140).

A study compared fracture rates of children in different European countries (Wales, Sweden, Norway, Finland)

Multiple trauma:

In polytraumatized patients, injuries of the extremities have the highest incidence compared to all other body

(141). Fracture rates in Wales (36 per 1000 children) were significantly higher than in Scandinavian countries (which were similar with about 17 per 1000 children). The Welsh:Scandinavian fracture ratio was 1.82. The excess of ball sports associated fractures (football, rugby) in Wales was significantly higher compared to the Scandinavian countries. This was believed to be one reason for the observed differences (141).

regions. In these individuals, an average of 6.8 injuries was found (142;143).

What is the impact on the Individual?

Trauma remains the leading cause of mortality patients under the age of 30 years. The primary goal of the therapeutic strategies is the complete functional recovery of all injured body regions. Moreover, there is a special emphasis on reintegration of the trauma victim with regard to their social life and the return-to-work rate (142;144;145). At 5 years after trauma, 81.2% of individuals with major fractures had some form of measurable disability (locomotion etc.) in a UK study population. Of those between the ages of 16-64 years 49% were not in paid employment at the time of follow up (146).

Another study in the UK described the prevalence of disability in young adults: 46 per 1000 persons suffered from limiting longstanding illness, 28 per 1000 with a permanent accident related disability and 10 per 1000 registered disabled. The overall prevalence of disability was 68 per 1000 with men reporting more disability than women. Therefore, injuries are an important cause of disability in young adults (147).

In Norway, differences in the length of activity restrictions for diverse types of fractures have been demonstrated (140). The mean number of activity restricted days for lower extremity fractures were 26 days and for arm fractures 14 days. Upper extremity fractures represented 62% of the activity restricted days, leg fractures 33% of all activated restricted days (140).

Major limb trauma is associated with varying degrees of mortality (Table 1.12) and morbidity (129).

Injuries to the extremities pose a major physical and psychological burden on a patient and the ability to return to pre-trauma functioning.

In a clinical study, observing patients 2 years after major trauma of the upper extremities, subjective complaints were reported in 16%. In contrast, subjective impairments of lower extremity function were observed in 41% (femur: 17%, knee 31%, feet 52%). The objective examination of these patients revealed impairments in the range of movement (ROM) of more than 50° in up to 88% of injured patients (145) (Table 1.13).

On a scale from 1-6 (1: excellent function; 6: bad function), 75% of trauma patients with major limb injuries assess the subjective function of their extremities between 1-3. Only 25% of these injured patients are not satisfied with their posttraumatic extremity function (148).

In polytraumatized patients, major limb injuries were a significant reason for subjective impairments (41% of all patients). Only head injuries led to a comparable incidence of subjective complaints (40%) (145).

Results of a German follow-up study (2 years after injury) (148) revealed, that the examination of major joints of the lower limb on x-ray 10 years after polytrauma demonstrated objective signs of arthrosis especially in the ankle joint (ankle joint: 32%, knee: 8% and hip: 22%). Subjective complaints of the ankle joint were found in a comparable proportion (28%), whereas significant differences were observed for the knee (53%) and the hip (7%).

Table 1.12 Death related to major limb trauma

Death Related to Major Limb Trauma	
Injuries of the upper and lower limb	Number of related deaths
Injuries of the shoulder and the humerus	183
Injuries of the elbow and the underarm	125
Injuries of the wrist joint and hand	125
Injuries of the hip and the femur	4.053
Injuries of the knee and the lower leg	136
Injuries of the ankle and the foot	4

Table 1.13 Impairment of the Range of Movement (ROM) 2 years after major limb trauma

Impairment of the Range of Movement (ROM) 2 Years after Major Limb Trauma			
	Impairment of ROM 0°-20°	Impairment of ROM 20°-50°	Impairment of ROM >50°
Shoulder	12	14	74
Elbow	5	18	77
Hand	10	12	78
Hip	7	16	77
Knee	4	8	88
Ankle	13	21	66

What is the impact on society?

Economic Impact

Trauma is responsible for a huge socioeconomic burden, magnified by many years of lost productivity and lost income of the patient. A study in the UK reported that injuries are an important cause of disability in young adults, particularly after age 16 (147). Costs associated with trauma include the direct costs of the trauma system, hospital and physician, as well as indirect costs for rehabilitation and lost productivity. These costs were calculated to be more than 157 billion US Dollar in the United States each year (149).

62% of men and 26% of women reported at least one accident since age 16 resulting in injury that required hospital treatment. Of these accidents, 3.2% caused permanent disability. The risk of disability increased with accident frequency. Injuries requiring hospital admission

carried the highest risk of disability (9.7%). Fractures constituted 21% of all injuries but were responsible for 32% of permanent disabilities. Of the permanent disabilities resulting from work related accidents, 82% involved the hand, whereas accidents at home result in 32% in involvement of the hand (150).

In Germany, the costs (prevention, hospital care, rehabilitation) caused by trauma are estimated to be about 14 billion Euro (129). A significant portion of these costs are caused by hospital treatment. Table 1.14 demonstrates the duration of hospital treatment for different injuries of the upper and lower extremity (129).

Calculation of costs for the hospital treatment of patients with major limb trauma is difficult.

Costs of an isolated cervical hip fracture in geriatric patients was estimated to be 15.000-20.000 US dollar during the first two years after trauma (151). Costs for the treatment of a patient with multiple injuries are significantly higher. A model for calculation of the costs (from accident to end of hospital treatment) in these patients was developed. Using this model, a patient with

multiple injuries of the pelvis and the lower extremities causes costs of 60.000 Euro (152).

Beside the initial treatment in hospital, further care of injured patients is needed. Table 1.15 demonstrates the utilization of rehabilitation of patients with major limb trauma and the average duration of treatment in Germany (129).

Table 1.14 Days of hospital treatment due to major limb trauma

Injuries to the upper and lower extremities	Days of hospital treatment/year
Fracture of the upper extremity	1.900.000
Fracture of the lower extremity	5.600.000
Dislocation	402.000
Open wound of the upper extremity	213.000
Open wound of the lower extremity	223.000

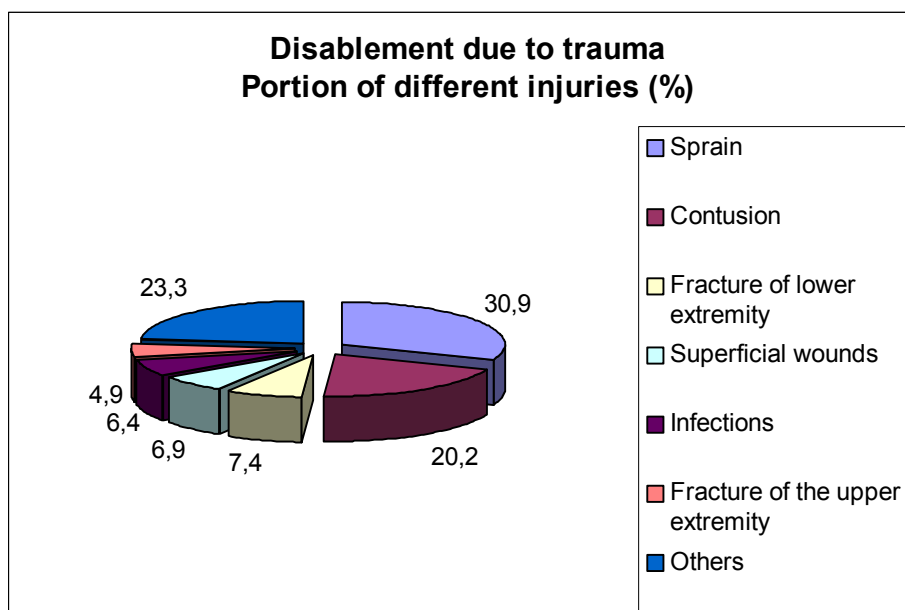
Table 1.15 Rehabilitation due to major limb trauma:

Injuries	Total number	Sex	Days per patient
Fractures of the upper extremity	1.799	male	35.3
	9.026	female	29.6
	10.825	Total	30.4
Fractures of the lower extremity	19.460	male	25.8
	64.249	female	27.1
	83.709	Total	26.8
Luxation	250	male	28.9
	1.154	female	29.6
	1.414	Total	29.5
Open wounds of the upper extremity	0	male	0.0
	94	female	31.3
	94	Total	31.3
Open wounds of the lower extremity	1.008	male	29.6
	564	female	29.7
	1.572	Total	29.7

Social impact

Trauma is one of the most important causes for disablement in Germany (73 million days per year, meaning 20% of overall disablement). The loss of productivity is estimated to be 6 billion Euro.

Fractures of the extremities lead to trauma-caused disablement in 12% (Figure 1.9). The average duration of disablement due to limb fractures is estimated to be about 47.5 days (129;153).

Figure 1.9 Disablement due to trauma

In Germany, trauma results in disability in about 180000 patients per year. Major reasons for disability are amputations of a limb in 24.000 patients and severe impairments of at least one limb in 84.000 individuals (129;153). The cumulative incidence rate of disability (defined as unable to carry out normal activities for 2 days or more) resulting from traffic injuries in Spain was 238 cases per 100,000 inhabitants, higher for man (287) than for women (194). The 20-24 year age group demonstrated

the highest incidence of disability (608) (154). In a UK study(140), 77% of included patients were men and at 5 years after trauma, 81,2% of individuals had some form of measurable disability (locomotion etc.). Of those between the ages of 16-64 years, 49% were not in paid employment at the time of follow up.

What is going to happen?

The numbers, finances and social burdens of trauma are staggering and must be addressed. In any age group, aggressive trauma care is beneficial and has been shown to reduce mortality (137;155;156;157).

The population of many European countries and the United States is aging yearly. Severe trauma is a major cause of death in patients older than 65 years and many trauma centers are seeing an increase in elderly patients. These polytraumatized patients often present with significant co-morbid conditions and limited physiologic reserves. Several studies have shown that elderly patients tend to have longer lengths of stay, increased complications and poorer survival and outcomes after severe trauma than younger patients (155;156). The incidence of poor functional recoveries from severe trauma in elderly patients is much more common than in younger patients. It was observed, that only 8% of traumatized, geriatric patients returned to their previous level of functional independence (157).

Fractures are one of the most important sources of disability among the elderly trauma population and are increasing even more rapidly than the elderly population themselves (158). In a population-based cohort study most recent fractures were observed in the upper (30%) and the lower extremity (38%). These fractures resulted in persistent and measurable impairment of the activities of daily living or general quality of life in elderly patients. Furthermore, fractures were associated with an increased mortality (158).

The impaired functional outcome among geriatric patients after fractures reflects the reduction in functional reserve with loss of muscle strength and bone density as well as reduced coordination and protective reflexes.

Emphasis must be placed on trauma prevention (e.g. falls in the elderly) to lessen its massive socio-economic costs. Improvements in rehabilitation after trauma may lead to reduced disability and trauma (158).

Sports Injuries

What are they?

The majority of sports injuries are similar to injuries that normally occur in non-athletes but they have occurred during sporting activities. Many injuries are common to a variety of sports, but others are sports specific. Injuries occurring in sports and physical activities are usually mild and many are never reported. More severe injuries may either be acute, chronic or overuse injuries. They may be caused by intrinsic or extrinsic factors, either alone or in combination. It is important to understand the mechanism

How common are they?

The increased involvement of people in sport at recreational and professional levels has resulted in a greater incidence of sports injuries, a large proportion of which are preventable. The incidence and types of sports injuries vary greatly depending on the sport, the number of people participating and the hours played. In some sports where high speeds and forces are encountered, there is a much higher risk of serious injury. The potential risks for injuries in sports seem to increase for all levels of athletes, with increasing participation, intensity and demands, as well as longer training periods.

Statistics on the incidence of sports injuries are inadequate and difficult to compare. Many of the studies on the incidence of sports injuries in a sport or group of athletes use different definitions of incidence. They vary from (a) days lost from training and sport (the American National Athletic Injury Registration System (NAIRS)), (b) one that limits athletic participation for at least the day after the day of onset (159), (c) the attendance at a casualty or a doctors surgery (160), or (d) an insurance claim (161;162)

What is the impact on individual?

Even a moderate sports injury may be disastrous to an elite or professional athlete if it prevents them training or competing particularly if it occurs just before or during a major competition. The psychological effect on the individual must not be underestimated. Sports injuries that require hospitalisation or time off work may cause financial loss both to the patients and their work place,

of injury in order to prevent further injuries. In this report we only considered sports injuries to the musculoskeletal system that would require medical attention, either to a casualty department, doctor or a physiotherapist. They include strains, sprains, dislocations, fractures, and lacerations. These injuries cause pain, loss of function and affect quality of life. They may result in loss of training or competition or absence from work.

A definition which takes all these factors into consideration is $\text{incidence} = \frac{(\text{no. sports injuries/per year})(10^4)}{(\text{no. participants}) \times (\text{average hrs of sports participation}) \times (\text{weeks of season/year})}$ (163).

It is difficult to determine the incidence of sports injuries and the types of injuries as the majority of patients with sports injuries that attend medical facilities do not have the sport or the mechanism of injury recorded. Insurance claims in some countries give some indication. . Studies from Sweden show that sports injuries make up 17% of all injury visits to emergency clinics at public health-care facilities. Acute injuries constitute 25-40% of all injuries in sports and physical activities.

Sports trauma made up to 10-15% of all accidents in West Germany and Finland. Forty years ago, sports injuries formed 1.4% of all injuries seen in emergency rooms, compared to 10% today

In 1990 in the Netherlands, with a total population of some 15 million, an overall sports injury incidence was found to be 3.3 injuries per 1000 hours spent playing; 1.4 of these injuries were medically treated.

and may give rise to increased insurance and legal costs. The effect of an injury to the musculoskeletal system depends on age and biomechanical properties of the tissue involved, under 16 years of age it is more likely to be an apophyseal injury e.g. Osgood-Slatter's disease, in older age group it may affect the musculotendinous junction or the actual tendon itself.

What is the impact on society?

Sports and physical activities of almost any kind are beneficial for the individual as well as for society as a whole in health promotion and the prevention of many diseases such as osteoporosis, cardiovascular and diabetes, and improving mental health.

Successful athletes play important role models for the young and are a source of national pride. The number of World Champions and Olympic medallists it produces often judges the success of a nation. Successfully. Hosting of major sports events is a great financial reward to the country from television and boost to tourism.

Injuries cost society billions of euros in both direct and indirect costs. Economic costs depend on the severity of the injury, the duration and type of treatment, working and playing time lost and the permanent damage to the individual. De Loes (1990), and Inklaar 1994 found that for all sports, the average length of Sick leave was 21.5

days after a sports injury(164;165). This is thought to be an over-estimation. Another study, Hoy et al (1992) quoted in Inklaar (1994), found that of 715 soccer injuries seen in a Danish A&E, 31% had been absent from work, but only 8% had any actual loss of income. Berger-Vachon et al (1986) found that the cost of soccer injuries amounted to \$1,625,000 for the Rhone-Alpes region of France in the 1980-81 seasons(166).

Participation in sport and leisure activities is widespread in nearly all developed nations. This is reflected in the amount of money spent by governments on sport and leisure and the role of international bodies, such as the EU, in trying to promote sport. An economic impact study of sport in Ireland has shown that sport accounts for £225 million pounds or 0.83% of the Gross National Product (167). The growth in sport is a result of greater earning capacity and increased leisure time among the population.

Occupational Injuries

What are they?

Occupational injuries should be subdivided into trauma resulting from an acute or instantaneous event (e.g., slips or falls) and musculoskeletal disorders [MSD] which result from small, but additive tissue damage sustained through performance of repetitive tasks.

In the following section, the MSDs will be discussed predominantly, which is due to two reasons. Firstly, occupational accidents and injuries resulting from a true traumatic origin do not differ significantly from major and minor limb trauma and therefore will be addressed mainly in the “major limb trauma” section. Secondly, the work-related MSDs account for the majority of all occupational illnesses and therefore need and deserve to be highlighted. Nonetheless, epidemiological data of occupational injuries of a true trauma origin are also included in the “Incidence and Prevalence” section.

MSDs related to occupation are predominately known as cumulative trauma disorders [CTD]. They may also be referred to as repetitive strain injuries [RSI], overuse syndromes, or cervical-brachial disorders (168;169).

Repetitive strain injuries is considered to be not a diagnosis but a catch-all term for symptoms and signs, which are located in the neck, upper back, shoulder, arm, elbow, hand, wrist and fingers. The symptoms may include pain, stiffness, tingling, clumsiness, loss of coordination, loss of strength, skin discoloration, and temperature differences (170).

Cumulative trauma disorders, which are disorders of the soft tissues and the surrounding structures, are considered to be work-related when the work environment and the performance of work contribute significantly to their development. They are therefore clearly distinguishable from classic occupational diseases such as asbestosis or silicosis, which do have a direct cause-effect relationship between a single hazard and a specific disease (168).

Key risk factors, which have been identified for the development of occupational injuries are repetition, high force, awkward joint posture, direct pressure, vibration, and prolonged constrained posture (168;169;171). As well as psychological factors (e.g. the role of psychological distress in workers exposed to a high level of physical exposure and psychological demand) (171;172) and a low level of job control (171). For example, certain occupations with forceful and repetitive use of the hands and arms like electricians and meat packers will be associated frequently with CTDs of the upper extremity such as tendinitis or nerve entrapments. The carpal tunnel syndrome (CTS) e.g. very well illustrates the biological plausibility of a CTD developing over time as a result of repetitive task-related efforts (169).

Because of the individual and socio-economic impact of CTDs and their increase in recent years, awareness needs to be raised in order to identify work-related CTDs and high-risk environment as well as to be adequately prepared to treat patients with symptomatic disorders (163). However,

one major factor remains crucial in dealing with patients suffering from and respectively threatened by a CTD diagnosis: Following identification of CTD, one has to

How common are they?

According to data released by the U.S. Bureau of Labour Statistics, the incidence of CTDs has increased by approximately 300% from 1977 through 1989 (173). In the decade from 1984 through 1994, there was an increase by approximately 700 % as the incidence rate of this disorder from 5.1 cases per 10,000 full-time workers in 1984 to 39 cases per 10,000 full-time workers in 1994 (174). CTDs have accounted for more than fifty percent of all occupational illnesses reported in the U.S since 1989 (169).

Data from the Netherlands suggest that each year, 8% of working Dutch citizens take time off work due to RSI symptoms. Although the number of people claiming disability benefit due to RSI is limited, it has grown consecutively over the last three years (170).

The increased incidence of work-related CTDs could be the result of a number of different factors, including increased public interest and targeted surveillance (168) as well as heightened awareness, improved accuracy of reporting, and diagnostic advances, thereby resulting in more complete recording (169). However, there might be also a true increase in the number of cases due to a general acceleration in the pace of work (169).

Despite extensive documentation, there remains some controversy as to the true extent of this entity, which might be due to difficulties in establishing specific diagnoses for many of these disorders and difficulties in establishing whether a CTD diagnosis is work-related or not (168). As a result of these problems and due to underreporting problems, existing data are more useful for interpreting trends as well as identifying high-risk occupations instead of estimating the true number of disorders (168).

Considering carpal tunnel syndrome (CTS) as an example for upper extremity disorders, an Italian survey of a group of meat industry workers found, that the prevalence of CTS varied from 11% to 53% dependent on case definition, being highest (53%) if based only on the symptoms or only on median nerve conduction studies but the prevalence of CTS was lowest (respectively, 15% and 11%) using the asymptomatic workers' electro-diagnostic reference values, alone or in combination with symptoms (175). These results correspond with those from a study of CTS in a large French footwear factory which revealed a prevalence of CTS of 16.6% and 11.7% (172). A survey of health care providers in a specific area of the U.S. (San

determine the degree to which this specific disorder is work-related (169).

Francisco Bay Area) assessed approximately 47% of all CTS cases to be work-related (176). This corresponds with the results of the 1988 U.S. National Health Interview Survey, which suggested a 50% rate of work-relation of all reported CTS (177). The survey also reported a 0.28% overall prevalence rate of CTS (356,000) among the 127 million active workers in the U.S. (177). In a study of Danish workers, the overall prevalence of CTS was found to be 1.6% on the working hand and 0.7% on the other hand. The overall annual CTS incidence was 0.62% on the working hand and 0.44% on the other hand (178). A recent survey from Denmark reported the one-year incidence of forearm pain to be 1.3% in a cohort of computer workers. Women had a two-fold increased risk of developing forearm pain (179) which corresponds with Dutch data finding that women reported more symptoms of RSI than men [Bongers et al. 2002]. In summary, prevalence rates of CTS between 0.6% and 61% have been reported depending on the specific occupational group studied (180).

Humeral epicondylitis had a prevalence odds ratio for 10 years of high exposure to elbow straining work of 1.7 for currently held jobs and 2.16 for formerly held jobs in a cross-sectional study of employees of German public gas- and waterworks (181).

Neck and shoulder pain with pressure tenderness in the muscles as another example of CTD was studied in a Danish survey among workers performing monotonous, repetitive work. The prevalence of neck/shoulder pain with pressure tenderness was 7.0% among participants performing repetitive work and 3.8% among the referents. An association was seen with high repetitiveness (prevalence ratio 1.8), high force (2.0), high repetitiveness and high force (2.3), high job demands (1.8), neck/shoulder injury (2.6), female gender (1.8), and low-pressure pain threshold (1.6), revealing the multi-factorial nature of neck/shoulder pain (182).

Back pain related to occupation has a yearly prevalence of 8% to 20% (183-186) (Table 1.16). The incidence rate of compensation for work-related back injury is ranging from 0.3 to 3.3 cases per 100 workers per year depending on the type of industry analysed (168). However, approximately 90% of workers with back injury caused by occupation might not seek compensation (168). These epidemiological data correspond with those from a German health survey of miners between 1955 and 1990 and showed a prevalence rate of low back pain as high as 143 per 1000 workers per year (187).

In summary specific industries are associated with a high CTD rate. According to the U.S. Bureau of Labour Statistics annual survey, the meat packing industry showed a yearly prevalence as high as 12,6% in 1994 (174); knit underwear manufacture 10.1%; motor vehicles manufacture 9.6%; poultry processor 8.3%; and house slippers manufacture 7.3%.

Regarding “true” trauma related to occupation, a recent Norwegian study analysed occupational injuries occurring at worksites in Oslo and treated by Oslo Emergency Ward or Oslo Ambulance Service. 1153 injury incidents were registered, 229 (20%) of which were considered serious. The median age of those patients was approximately 32 years. The estimated yearly incidence of injuries at worksites was 14 per 1000 employees. The incidence amongst men was three times higher than amongst women and it was highest in the youngest age groups.

What is the impact on the individual?

Work related CTD are associated with work loss and reduced quality of life. Severe occupational accidents result in a significant number of victims developing post-traumatic stress disorder, which may lead to considerable impairment in work and daily life (186;187). People who

Electricians, carpenters and police officers had the highest observed incidences (188). An evaluation of approximately 3.000 accidents in Germany which occurred during occupational activity in industry likewise found a higher incidence of injuries related to occupation in men as compared with women. It was also found that most of the injuries of men were more serious than those of women and injuries of the hand were the most frequent (189).

The community-based Bristol Stress and Health Study, which focuses on the relation between accidents and cognitive failures at work, found that 4% of workers reported an accident at work, 8% reported quite or very frequent minor injuries and 13% reported quite or very frequent cognitive failures. Those accidents at work were strongly associated with being male, smoking and higher negative job characteristics (190).

were injured at work are more likely to undertake litigation, develop symptoms consistent with posttraumatic stress disorder as well as non-return to work and is associated with higher psychosocial morbidity (189).

Table 1.16 Prevalence of back pain in different countries in workers and the general population

Investigator and Year	Population studied	Condition	Prevalence (%)
Anderson 1986(177)	Workers U.K.	Back pain	20
Svane 1987(180)	Workers Denmark	Low back pain	8
Leigh and Sheetz 1989(179)	Workers U.S.	Back/spine trouble	20
Guo et al. 1995(178)	Workers U.S.	Back pain > 1 week	18
Cunningham and Kelsey 1984(185)	General population U.S.	Back pain	14 - 16

What is the impact on society?

Economic impact

In 1989, the total U.S. workers’ compensation cost for occupational trauma of the upper extremity alone accounted for approximately \$ 563 million (194). This estimation did not cover indirect costs such as administrative costs for claims processing, lost production time if disability occurred, or costs related to the replacement of a disabled worker (194). However, the total costs are estimated to be even two to three times higher as compared to the compensation costs (195), which might lead to a total amount of \$ 1.5 billion annually in the U.S.

Concerning low back disorders, the total U.S. workers’ compensation cost for occupational trauma of the lower spine in 1989 was estimated to be \$ 11.4 billion (196). Considering that only 10% of workers with occupational low back pain seek compensation (162), one can assume the resulting enormous costs to society, which could reach between \$ 50 billion and \$ 100 billion yearly in the U.S. (197).

Accidents and injuries from a true traumatic origin at work account for several million working days lost each year in the U.K. (190).

The results of the 2001 annual report of the German Federal Agency for Workplace Safety (Bundesanstalt für Arbeitsschutz und Arbeitsmedizin) regarding the cases of

compensation for occupational injuries are summarised in Table 1.17 (198-200).

Table 1.17 Number of fatal occupational accidents and injuries in Germany (193-195)[BAUA 2001]

				Change [%]	Change [%]
Year	2001	2000	1999	2001 - 2000	2000 - 1999
Number of cases	36.901	39.088	41.837	- 5.6	- 6.6

Social impact

Most cross-sectional studies emphasise the association of job or task demands and work place psychological factors and work-related CTDs (168). High work loads, perceived time pressure, increasing work pressure, high work-load variability, poor work content, lack of job control, poor social relations at work, monotonous work, and little social support are considered to have the most consistent association (168). Job dissatisfaction has been reported to be clearly associated with the onset of CTDs related to occupation (201) as well as psychosocial factors associated with the worker (e.g., personality traits and emotional problems) and the non-work environment (e.g., living alone) (168).

A Swedish survey of injury risks and socio-economic groups in different settings revealed a higher morbidity in lower socio-economic groups, which resulted partially from work-related differences, where 25% of the injuries analysed occurred, but also from the differential impacts of other living environments, e.g. home and transport areas. It was concluded, that differences between socio-economic groups in care seeking, injury lethality, injury susceptibility, and risk exposure may influence the social patterning of injury morbidity.

What is going to happen?

Protecting people from work-related CTDs poses two major challenges: Firstly, specific risk factors and environments need to be identified, and secondly, appropriate modifications of work organisation, tasks, work stations, and tools need to be instituted (169). Consequently, determining the predictiveness of personal and occupational factors for the onset of CTDs in occupations requiring repetitive work (171) and controlling and reducing those work-place risk factors encountered by the affected worker may be important components of any treatment plan (168).

Given both the social and economic impact of occupational CTDs and the fact that they are largely preventable, government agencies as well as all parts of society need to be alerted in order to make the workplace a safer environment and to lessen the socio-economic costs of occupational trauma.

The results of the 2001 annual report of the German Federal Agency for Workplace Safety (Bundesanstalt für Arbeitsschutz und Arbeitsmedizin) reveal a reduction in the number of all and the number of fatal cases of occupational injuries (Table 1.18 and Table 1.19 (198-200)).

Table 1.18 Number of all occupational accidents and injuries in Germany (192-194)[BAUA 2001]

				Change [%]	Change [%]
Year	2001	2000	1999	2001 - 2000	2000 - 1999
Number of cases	1.629.707	1.748.840	1.808.387	- 6.8	- 3.3

Table 1.19 Number of fatal occupational accidents and injuries in Germany (192-194)[BAUA 2001]

				Change [%]	Change [%]
Year	2001	2000	1999	2001 - 2000	2000 - 1999
Number of cases	1.874	1.973	2.148	- 5.0	- 8.1

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Part 2

Who is most at risk?

2.1 Introduction

- What are the determinants of health?
- How to interpret risk
- How to use risk factors

2.2 Determinants of musculoskeletal conditions

- Osteoarthritis
- Rheumatoid arthritis
- Back pain
- Osteoporosis and fracture
- Trauma

2.3 Distribution of determinants of musculoskeletal health and future trends

- Age
- Obesity
- Diet and nutrition
- Physical activity
- Smoking
- Alcohol
- Home and leisure accidents
- Road traffic accidents

2.4 Priorities and targets for intervention

2.1 Introduction

What are the determinants of health?

The health of an individual is determined by health conditions, by contextual factors (which are both environmental and personal), and by the interaction of these. Environmental factors include health and social interventions. The chance of any of these affecting health can be considered a risk factor to that person's health.

Types of determinants

Determinants of musculoskeletal health are therefore conditions such as osteoarthritis, rheumatoid arthritis, osteoporosis and trauma or problems such as back pain. Their occurrence or outcome may be influenced by factors which may be considered as personal intrinsic, personal extrinsic and environmental.

Personal intrinsic risk factors relate to the characteristics or attributes of the individual and some are modifiable. Personal extrinsic risk factors relate to the immediate environment of the individual. Environmental risk factors

There are also factors that influence the risk of a person having a health condition. All these factors that may influence the occurrence or the outcome of a health condition are determinants of health and influencing them may influence the health of the individual and of the population.

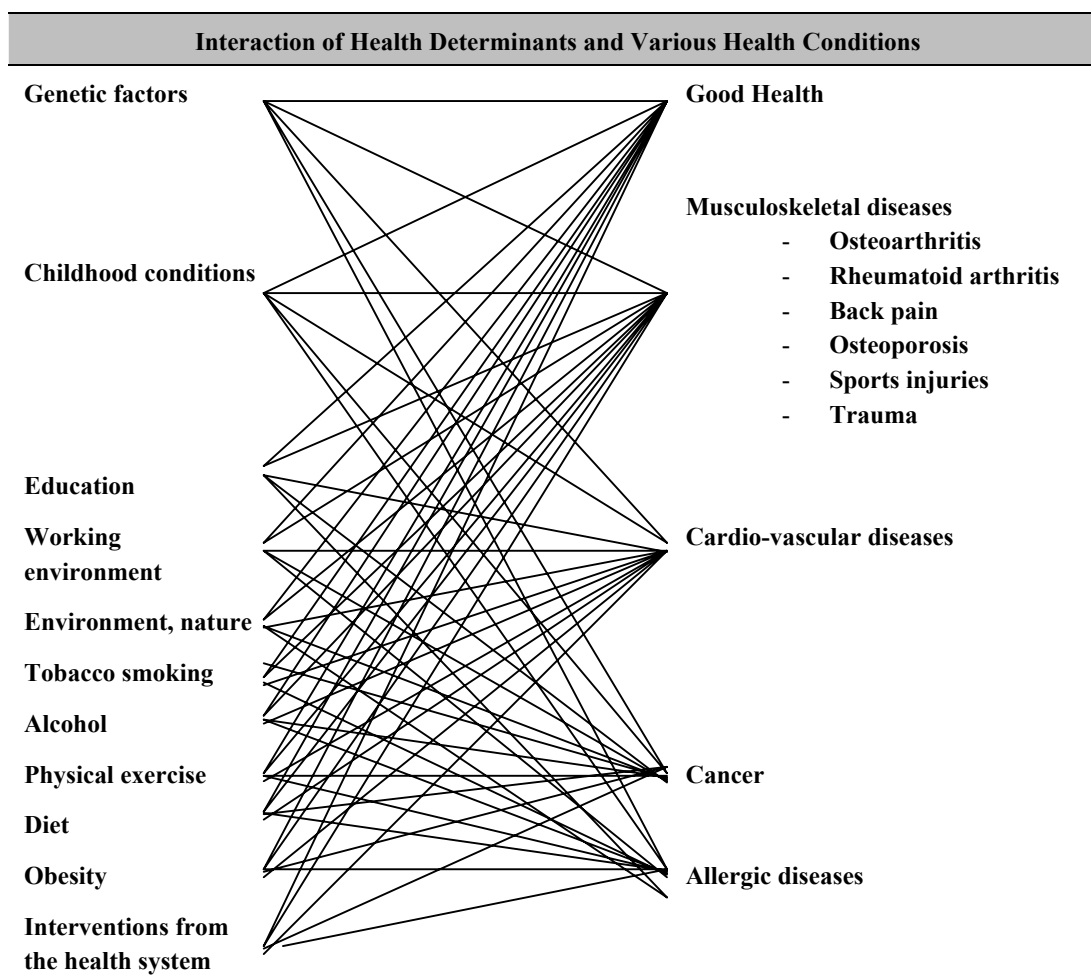
relate health, social and educational interventions as well as to the wider geographical environment (Table 2.1).

There are wide variety of determinants of the incidence, prevalence and outcome of musculoskeletal conditions. Many of these are also associated with other chronic diseases (Figure 2.1) and therefore they carry a significant health burden. Modifying them will therefore have a greater potential benefit on health than just related to musculoskeletal conditions.

Table 2.1 Examples of determinants of health

Examples of Determinants of Health			
Conditions and Problems	Personal Intrinsic	Personal Extrinsic	Environmental
Osteoarthritis	Age	Housing	Natural environment
Rheumatoid arthritis	Gender	Work type	Human-made physical environment
Osteoporosis	Genetics	Personal transport	Pollution: sanitation, water, air
Back pain	Diet		Personal support and assistance
Musculoskeletal trauma and injuries	BMI		Health, social educational systems
	Alcohol		Health, social educational interventions
	Smoking		
	Exercise		
	Co-morbidities		
	Education		
	Psychological assets		

Figure 2.1 Interaction of health determinants and various health conditions



How to interpret risk

Risk can be separated into relative risk or absolute risk. Relative risk is a statistical comparison undertaken between two groups of people in a well-defined population. It is a measure of how much a particular risk factor (e.g. smoking) influences the risk of a specified outcome (e.g. osteoporosis). For example, a relative risk of 2 means that people with the identified risk factor have a twofold increase of having the specified outcome.

In order to assess total disease risk, absolute risk has to be considered. Absolute risk is the actual number of exposed versus unexposed people (to the identified risk) who go on to develop the specified outcome. This will reflect the prevalence of the risk factor in the population. This is important when considering the possible impact of an intervention.

Some risk factors may be modifiable, such as physical fitness, and in this way the prevalence or outcome of conditions and problems may be altered. Other risk factors cannot be modified, but may be of value in identifying who needs more active intervention to prevent the development or to improve outcome of a condition. Surveillance of risk factors can therefore give information about necessary health strategies or of possible future resource needs by identifying the at risk population.

Communicating and understanding risk is important in decision making but is complex. It is however central to informed policy and decision making by policy makers, clinicians, patients and the public.

How to use risk factors – screening, selective case finding and clinical decision making

Risk assessment can be used to prioritise either individuals or populations that can be targeted for preventative or medical interventions. Once risk factors have been identified a decision needs to be made as to how to identify such individuals. Screening is the assessment of an unselected population to identify those at high risk but is not cost effective unless certain criteria are met. It has been proposed that (1) screening for risk factors should only take place if:

- The condition has a recognisable early phase and early treatment can be shown to improve prognosis.
- Effective treatment is possible and available.
- The test for the condition should be relatively simple, not harmful and acceptable to the patient.
- The test should achieve a balance between false positives and false negatives which is related to the severity of consequences of wrong diagnosis both for the health care system and the patient.
- Screening must be sustainable once introduced and not just part of a limited specific initiative.

Selective case finding is an alternative way of identifying individuals at high risk by the presence of some obvious risk factor. Success of this is dependent on public, patient and medical awareness of such risk factors. The initial risk factor in such a selective approach may be of high sensitivity and identify false positives but a second stage using factors of high specificity will allow the cost effective targeting of those most at risk.

Risk factors may be used to influence individuals health behaviour – either encouraging them to modify their health behaviour or resulting in them seeking health care interventions. For example, awareness of the risks associated with lack of physical fitness may lead to people undertaking more exercise. Awareness of risks of adverse outcomes will also enable people to make informed decisions about their management as they will be able to weigh up the advantages and disadvantages of any intervention compared to that of their condition.

Monitoring risk factors for disease onset and persistence will also lead to a better framework for identifying resource and health needs for prevention and control.

2.2 Determinants of musculoskeletal conditions

Osteoarthritis

Age is the strongest predictor of the development and progression of radiographic osteoarthritis. Some types are hereditary – in particular of the finger joints. Congenital abnormalities such as congenital dislocation of the hip or hip dysplasia are also risk factors for the development of osteoarthritis. Obesity (high body mass index) is a risk factor for the development of osteoarthritis of the hand, knee (odds ratio, 8) (2), and hip and for progression in the

knee and hip. Trauma and certain physically demanding activities or occupations are also risk factors for the development of osteoarthritis of the knee and hip (3). Farming presents the greatest relative risk for osteoarthritis: 4.5 for those who work in farming for 1–9 years and 9.3 for those who farm for ≥10 years (4). A negative association exists with osteoporosis and smoking. Table 2.2 gives the purported risk factors for osteoarthritis.

Table 2.2 Risk factors for incidence and progression of osteoarthritis of the knees, hips, and hands. (adapted from Petersson and Jacobson (3))

Risk Factors For Incidence And Progression Of Osteoarthritis			
Type of osteoarthritis	Degree of evidence for association		
	Strong	Intermediate	Suggested
Incidence			
Knee	Age	Vitamin D	Quadriceps strength
	Female sex	Smoking (protective)	(protective)
	Physical activity	Alignment	Intensive sport activities
	High bone mass index		
	Bone density		
	Previous injury		
	Hormone replacement therapy (protective)		
Hip	Age	Physical activity	Injury
		High bone mass index	Intensive sport activities
Hand	Age	Grip strength	Occupation
		High bone mass index	Intensive sport activities
Progression			
Knee	Age	Vitamin D	Intensive sport activities
		Hormone replacement therapy	
		Alignment	
Hip	Age	Physical activity	High bone mass index
			Intensive sport activities

Rheumatoid arthritis

When we discuss risk factors or determinants for RA, these can be divided into: a) risk factors for susceptibility or occurrence, and b) risk factors for severity of the

disease. Although these overlap, it is of value to discuss the contribution of different risk factors for each phase of the disease. Some of these factors are possible to modify.

Risk factors for occurrence of rheumatoid arthritis

Genetic risk factors have classically been studied in twin studies and it has been shown that the shared risk for RA development between a pair of identical twins is 15%. This could be compared with a risk of 0.8% in the general population. The genetic contribution to RA susceptibility has been estimated to around 60%, but there is not one single gene expression that has been identified to account for this risk.

The incidence is influenced by age and gender. It is a rare disease in men under the age of 35 and females reach an incident peak approximately 10 years earlier than men (55-64 vs 65-75), and overall it is more common among women than men. In the very oldest age group men have been shown to have a higher incidence. The susceptibility might be more connected to birth cohort than to age. There is some connection to female hormonal factors and reduced

occurrence of RA in younger women has been connected to the use of oral contraceptives. As a contrast hormone replacement therapy has not been shown to reduce the risk of development of RA in women after menopause.

Infection or immunization might act as a trigger of RA onset but there is no connection to a single infectious agent. Smoking has been shown to increase the risk of

Risk factors for severity of RA

The prognosis is to some extent determined by genetic factors. A shared epitope of various human leucocyte antigen-DRB1 alleles is associated with rheumatoid arthritis and probably plays a greater role in determining severity than susceptibility to rheumatoid arthritis. The prevalence of the shared epitope varies considerably between populations, which may, in part, explain the different patterns of rheumatoid arthritis seen around the globe. Baseline predictors of future radiological change in patients with early rheumatoid arthritis that have been identified in various cohorts include older age, female gender, longer disease duration at presentation, presence

Back pain

The occurrence of low back pain (Table 2.3) is associated with age, physical fitness, smoking, excess body weight, and strength of back and abdominal muscles. Psychological factors associated with occurrence of back pain are anxiety, depression, emotional instability, and pain behaviour (e.g. [exaggerated] outward display of pain, guarding). Occupational factors, such as heavy work, lifting, bending, twisting, pulling, and pushing, clearly play a role, as do psychological workplace variables, such as job dissatisfaction. Psychosocial aspects of health and work in combination with economic aspects seem to have more impact on work loss than physical aspects of disability and physical requirements of the job.

developing RA, and so has obesity. By contrast regular consumption of alcohol might protect against RA developing. Diet factors are discussed but the findings are not consistent. Patients often relate the debut of RA to some traumatic event, physical or psychological, but there is no clear evidence to support these theories.

of rheumatoid factor, and presence of increased tenderness and inflammation (5).

Female gender has been reported as a risk factor for worse outcome with regard to disability and excess mortality, mainly due to cardiovascular disease. Smoking is associated with a higher risk for development of extra-articular disease. It has also been shown that the prognosis may be worse in socially deprived areas.

On the other hand has modern treatment of RA been shown to reduce disability and radiological progression.

It is important to identify as early as possible those people with low back pain who at risk of longterm pain and disability. It is this small group of people that accounts for substantial health care utilisation and sick leave. Psychosocial factors such as distress, depressive mood and somatisation, are important in the transition from acute to chronic low back pain. Individual and workplace factors, such as obesity, job dissatisfaction, low educational level, high levels of pain and disability and unavailability of light duties are associated with chronicity of low back pain. The identification of these “yellow flags” has been recommended as a way of recognising people with acute back pain who are at high risk for chronicity.

Table 2.3 Risk factors for occurrence and chronicity of low back pain (6)

Risk Factors for Occurrence and Chronicity of Low Back Pain		
	Occurrence	Chronicity
Individual factors	Age Physical fitness Strength of back and abdominal muscles Smoking	Obesity Low educational level High levels of pain and disability
Psychosocial factors	Stress Anxiety Mood/emotions Cognitive functioning Pain behaviour	Distress Depressive mood Somatisation
Occupational factors	Manual handling of materials Bending and twisting Whole-body vibration Job dissatisfaction Monotonous tasks Work relations/social support Control	Job dissatisfaction Unavailability of light duty on return to work Job requirement of lifting for ¼ of the day

Osteoporosis and fractures

Apart from age and female sex, the major determinants of fracture are falling, low bone mass, and previous low trauma fracture. Some risk factors identify those more likely to fall (Table 2.4) and those who may have osteoporosis or are at risk of fracture (Table 2.5). Bone

density has the strongest relation to fracture, but many fractures also occur in women without osteoporosis. Combinations of risk factors are being used to predict 10-year probability of fracture.

Table 2.4 Risk factors for falling in the elderly

Risk Factors for Falling in the Elderly	
Intrinsic factors	General deterioration associated with ageing Balance, gait, or mobility problems Visual impairment Impaired cognition or depression “Blackouts”
Extrinsic factors	Personal hazards Multiple drug therapy
Environmental factors	Indoor/home hazards Outdoor hazards

Table 2.5 Risk factors for bone loss, development of osteoporosis, and fracture

Risk Factors for Bone Loss, Development of Osteoporosis and Fracture	
Ageing	Various disorders associated with osteoporosis
Female sex	
Previous fracture after low energy trauma	
Radiographic evidence of osteopenia or vertebral deformity, or both	
Loss of height and thoracic kyphosis (after radiographic confirmation of vertebral deformities)	
Low body weight (body mass index <19 kg/m ²)	
History of corticosteroid use	
Maternal family history of hip fracture	
Reduced lifetime exposure to estrogen (primary or secondary amenorrhoea or early natural or surgical menopause (<45 years))	
	Rheumatoid arthritis
	Malabsorption syndromes, including chronic liver disease and inflammatory bowel disease
	Primary hyperparathyroidism
	Longterm immobilization
	Behavioural risk factors
	Low calcium intake (<500–850 mg/day)
	Physical inactivity
	Vitamin D deficiency
	Smoking (current)
	Excessive alcohol consumption

Trauma

There are many risk factors for the occurrence of injuries (Table 2.6). Different factors have an importance depending on age, environment and main activities. In the young risk factors in the home environment (toys, kitchen, animals etc.), games (playgrounds, swimming etc.), traffic (bikes, cars etc.) and in the family (domestic violence, angry parent syndrome) dominate. In the adolescent participation in sports, traffic and other dangerous activities are the main risks, aggravated by alcohol, recreational drugs and inappropriate self-control.

In the working age population occupational risk factors (inappropriate protection, training etc.) supplement the risks in traffic, sports and leisure activities. In the old age reduced physical fitness, reduced bone mass, concomitant diseases and medication increase the risk for injuries at home (unsafe homes) or in public (traffic).

In general, inappropriate risk awareness is the main problem. On a personal level inappropriate training, experience and physical fitness, inadequate protection, inadequate obeying of rules are key risk factors for occurrence of trauma. Effects of alcohol and drugs decrease the internal control mechanism and increase the risk for injuries. On a generic level, unsafe public or private environment might add further risk factors.

Following a traumatic event different determinants have an impact on outcome of the injury (Table 2.7). In general, inadequate delayed or inappropriate treatment and rehabilitation can lead to worse outcomes. On a personal level age, overweight, co-morbidities, complications and additional medication, drugs, alcohol and smoking have an important influence on the final outcome. In addition social-economic factors (eg medico-legal compensation) play an important role.

Table 2.6 Risk factors for the occurrence of trauma

Risk factors for the Occurrence of Trauma			
Children	Youth	Working age	Old Age
Unsafe homes (electricity, oven, etc.)	Traffic	Traffic	Traffic
Unsafe playgrounds and swimming pools	Unsafe roads	Unsafe roads	Unsafe roads
Participation in traffic	Unsafe vehicles	Unsafe vehicles	Unsafe vehicles
Inappropriate use or badly designed car seats	Unprotected participation in traffic	Unprotected participation in traffic	Unprotected participation in traffic
Skateboards, Rollerblades, Bicycle	Contact sports (mismatched competitors)	Contact sports (mismatched competitors)	Late first-time participation in potentially dangerous activities
Unsafe toys	Participation in dangerous activities (parachute. hang gliding, boats etc.)	Unsafe sports facilities	Not-using protective gear correctly
Animals	Unsafe sports facilities	Participation in dangerous activities (parachute. hang gliding, boats etc.)	Inappropriate and mismatched experience
Inability to swim	Not-using protective gear correctly	Late first-time participation in potentially dangerous activities	Inadequate obeying of rules
Hyperactivity (ADHD)	Inappropriate training and technique (Inexperience, Overuse, etc.)	Unsafe workplace	Environmental factors (climate, weather, temperature, etc.)
Clumsiness	Inadequate obeying of rules	Not-using protective gear correctly	Alcohol, recreational drugs, drugs
Angry parent syndrome	Inadequate enforcement of rules	Inappropriate training and technique (Inexperience, Overuse, etc.)	Medication
Domestic violence	Inappropriate and mismatched experience	Inappropriate and mismatched experience	Reduced bone strength
Low social economic level	Environmental factors (climate, weather, temperature, etc.)	Inadequate obeying of rules	Concomitant diseases
	Clumsiness	Inadequate enforcement of rules	Malnutrition (eg diabetes)
	Hyperactivity (ADHD)	Alcohol, recreational drugs, drugs	
	Alcohol, recreational drugs, drugs	Stress	
	Low social economic level	Low social economic level	

Table 2.7 Risk factors and determinants for outcome of trauma

Risk Factors and Determinants for Outcome of Trauma	
Severity of injuries	Medication
Old Age	Environmental factors
Overweight	Delayed Therapy
Co-morbidity	Transportation of victims
Poor nutrition	Inadequate Therapy
Immobility	Inadequate rehabilitation
Infection	Inadequate compliance with medical advice
Thrombosis / PE	Medicolegal compensation
Alcohol	Socio-economic factors
Smoking	

2.3 Distribution of determinants of musculoskeletal health and future trends

There are several common determinants for the incidence, prevalence or outcome of the various musculoskeletal conditions. These are also determinants for various other health conditions and outcomes. They are

- Age
- Obesity
- Poor nutrition
- Lack of physical activity / fitness
- Smoking
- Excess alcohol
- Accidents and injuries

The burden of disease that is associated with these determinants of health usually ignores the impact they have on the occurrence and outcome of musculoskeletal

conditions (7), despite these conditions being a major contribution to the burden of disease in Europe.

The distribution of these determinants across Europe and future trends will be considered, as this should influence the development of strategies and prioritisation for their implementation in different parts of Europe.

There are a number of databases available within Europe which provide information on determinants and risk factors within the different European countries. The main databases are outlined in Table 2.8.

Other determinants are important for the occurrence and outcome of musculoskeletal conditions but as they are often not relevant to other health conditions, the collection and availability of data is less consistent across Europe. It is not therefore possible to identify levels of risk or trends within the different populations across Europe.

Table 2.8 European Datasets of Determinants of Health

Dataset	Type of Data	Date
Eurostat - Key Data on Health 2000	Lifestyles, mortality, health risks	2001
OECD Health Data 2001	Mortality, morbidity, lifestyle & behaviour, environment, demographics	2000
WHO Health For All Database	Demographic, morbidity, mortality, life styles, environment	1970-2002

Ageing population



The total population in the European Union (EU) has increased from 340 million in 1970 to 375.3 million in 1999 (Figure 2.x). The rate of growth since 1988 has slowed to about 1.5 million per year and the increase in

population is now based more on migration than a natural increase. The number of males and females in each age group are relatively homogenous up to the age of 55, but at older age bands there are more women. Decreasing birth rates and increasing survival have contributed to the rising number of old people in the EU. The proportion of those over 65 years of age and the very old (+80) have increased steadily over the past two decades. (Figure 2.x, Table 2.9). Eurostat has prepared projections to predict both population and mortality growth in EU countries. Using the baseline scenario they predict the proportion of young people in the total population, currently 24%, to decline until 2020. They predict this trend to follow in all EU countries, with the exception of Luxembourg, where the proportion of growth is expected to remain at present levels. Eurostat projects an increase in the proportion of elderly people in the EU. Increasing from 21% in 1998 to 27% in 2020. This trend will be apparent in all EU

countries. Italy and Spain are expected to have the highest proportion of elderly people.

Figure 2.2 Population growth in Europe

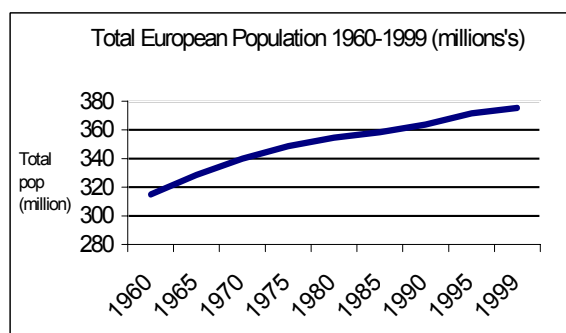
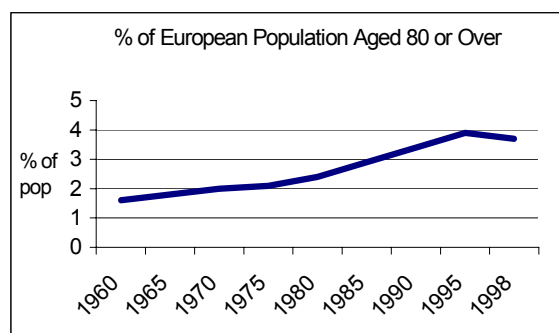


Figure 2.3 The increase in the very elderly in Europe



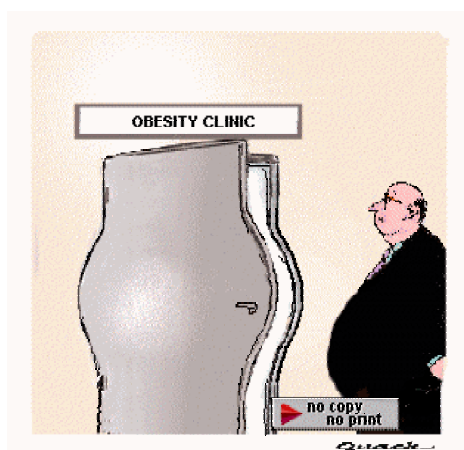
Source Eurostat Key Data on Health 2000 (8)

Table 2.9 Comparison of risk factors in the EU (Source Eurostat Key Data on Health 2000) (8)

Country	% of Total Pop aged 65-79 (1999)	Rank	% of Total Pop who are daily smokers (1995)	Rank	% of Total Pop BMI* 30+ (1996)	Rank
Austria	11.9	8=	28	9=	11.9	9
Belgium	12.9	3	31	6=	14.8	6
Denmark	11	13	38	2=	12.2	8
Finland	11.3	11	20	15	16.8	4
France	11.9	8=	35	4	9	14
Germany	12.1	7	25 (West)	12	9.2	13
Greece	13	2	39	1=	21.7	1
Ireland	8.8	15	29	8	10.4	10
Italy	13.4	1	38	2=	9.7	11=
Luxembourg	11.1	12	28	9=	15.6	5
Netherlands	10.3	14	34	5	9.7	11=
Portugal	12.2	6	24	13	17.3	3
Spain	12.6	4=	31	6=	14	7
Sweden	12.6	4=	22	14	8.7	15
United Kingdom	11.7	10	27	11	18.2	2
Average	12.2		29		13	

* BMI = Body Mass Index

Obesity



The Body Mass Index (BMI) or Quetelet's indexes is a measure of a person's weight relative to his or her height that correlates fairly well with body fat content in adults. The BMI is the most useful measure of obesity in adults when only weight and height data are available. BMI is calculated by dividing body weight (in kg) by body height (in metres) squared. A person with a BMI of between 18 and 20 is considered underweight, and is severely underweight when below 18. A person with a BMI between 27 and 30 is overweight and severely overweight with a BMI of 30 or more. There is no international consensus about the classification of moderate obesity although a range of 25-30 is sometimes used.

Health risks (in particular ischaemic heart diseases, hypertension, diabetes and others) increase considerably when the actual Body Mass Index (BMI) exceeds the desirable BMI by more than 20% (or when BMI exceeds 27) and increases rapidly with a BMI of 30 and over. Most

Diet & Nutrition

The burden of disease attributable to nutrition is greater than is often appreciated. Preliminary analysis from the Institute of Public Health in Sweden suggests that 4.5% of DALYs are lost in EU countries alone owing to poor nutrition, with an additional 3.7% and 1.4% lost owing to obesity and physical inactivity. The total percentage of DALYs related to poor nutrition and physical inactivity is therefore 9.7%, compared with 9% related to smoking. Cardiovascular diseases and cancer, together with diabetes, account for about 30% of the total DALYs lost every year in the WHO European Region. There is international consensus that saturated fatty acids help explain the rise in

Europeans have a 'normal' BMI (between 20-27); (69.5% of men and 64.6% of women). However, 6.1% of men and 6.9% of women are severely overweight and 0.9% of men and 3.1% of women are severely underweight.

Overweight and obesity in both children and adults are increasing problems, and are due mainly to physical inactivity and excess energy intake. In the European Union as a whole, between 1996 and 2002, average weight increased by nearly 2%. Obesity is accompanied by serious co-morbidities such as non-insulin dependent diabetes mellitus and cardiovascular diseases. The risk of diabetes is increased up to 100-fold by obesity, and 80% of the prevalence of diabetes can be attributed to obesity and overweight. Obesity has serious complications, is difficult and expensive to treat and reduces life expectancy by 8–10 years. Prevention of obesity is therefore the best strategy. Non-insulin dependent diabetes is the most important medical consequence of obesity and is therefore also becoming one of the major diseases in Europe, with approximately 4% of the population affected in most countries.

Considerable differences exist within the EU. Greece and the UK have the highest levels of severe obesity in women (BMI>30) while Germany, Sweden and France have the lowest. In the case of men Greece and Portugal have the highest levels of severe obesity while the Netherlands, and Italy have the lowest.

Severely underweight people are the most frequent in Luxembourg, and Belgium. For men, being underweight is less of a problem: only UK (2.1%) and Belgium (1.9%) have higher than European averages.

cholesterol levels among the population; this is fundamental to the epidemic of coronary heart disease, the leading cause of mortality in the WHO European Region.

The consumption of fruit and vegetables reduces the risk of chronic disease. Yet the majority of countries of the Region do not meet the current WHO recommendations of 400 g per person per day.

Fat intake is too high in the majority of European countries. WHO recommends a daily fat intake of less than 30% of total energy.

Physical Activity

Physical activity is all movements in everyday life, including work, recreation, exercise and sporting activities. Lack of adequate physical activity is one of many lifestyle factors related to a number of chronic diseases in addition to musculoskeletal conditions. These include coronary heart disease, hypertension, colon cancer and diabetes mellitus. The total percentage of DALYs related to poor nutrition and physical inactivity is therefore 9.7%, compared with 9% related to smoking.

It has been estimated that eliminating physical inactivity would result in 15–39% less coronary heart disease, 33% less stroke, 12% less hypertension, 12–35% less diabetes, 22–33% less colon cancer, 5–12% less breast cancer and 18% less osteoporotic fractures. A Finnish estimate of the impact of physical activity on the use of hospital services showed that most active men spent 36% and most active women 23% fewer days in hospital than the least active people.

According to the Health and Fitness Survey (8), from a list of 28 options the most popular physical activities in EU are walking, gardening, cycling and swimming. With increasing age, the rates of participation in all activities decreased with the exception of gardening and walking where the levels increased. Differences between men and women are not significant. The number of hours spent participating in various leisure physical activities in a typical week has significant inter-country variation ranging from around 10% of Finns declaring 0 hours of activity to approximately 60% of Portuguese. As a measure of

physical inactivity, respondents were asked about the number of hours they spent sitting. Almost half the EU sample spend between 2 and 6 hours sitting in their leisure time and a further 38% spend over 3 hours sitting. A quarter of the French compared to over a half of the Dutch sit for more than 3 hours. Portugal is the only country where 20% of respondents said they did not sit at all during their leisure time.

Inactivity is higher depending the educational background of respondents. The perceived barriers to increase levels of physical activity suggest that the majority of people in Europe are not active as a result of work/study (28%), or they perceive themselves as ‘not the sporty type’ (25%), this pattern is consistent across all EU countries. Only 10% of Europeans perceive themselves as being too old for exercise, but this varies from 3% in Finland to 21% in Greece. 11% of Europeans believe that poor health is a barrier to activity, this varies from 6% in Italy to 26% in Greece, however, in most countries individual values are in line with the EU total.

In terms of physical activity at work, almost 50% of EU population spend 2-6 hours daily sitting at work and one fifth spend 6 or more hours. This pattern is true across all countries. The UK has the highest percentage of people sitting down at work for 2-6 hours, while Austria has the least. The Netherlands and France have the lowest levels of people not sitting down at work, while Finland and Luxembourg have the highest.

Smoking



About 215 million Europeans smoke, of whom 130 million are male. The annual number of deaths attributable to the consumption of tobacco products is estimated at 1.2 million (14% of all deaths). According to

data from 25 countries, covering 60% of the population of the Region, average smoking prevalence in the male population is around 34% for the western European countries and 47% for eastern European countries. In the female population the prevalence is some 25% for western European countries and 20% for eastern European countries. (7).

The Eurobarometer study (2003) (9) showed the difference between European countries (Table 2.9) and found that Greece, Denmark and Italy had the highest smoking rates in the EU with Finland, Sweden and Portugal the lowest.

Results from a recent Eurostat study (1994-1998) show the percentage of smokers in the EU range from 19.5% of the population in Portugal to 41.5% in Denmark. In each country men are more likely to smoke with the exception of Sweden where 30.9% of women smoke in comparison to 29.9% of males.

However, results from the National Health Surveys (compiled by Statistics Sweden and by Eurostat) indicate that the general trend in smoking is declining for males and females in most EU countries for which data is available from 1970. It is worth noting that the prevalence of smoking among women is not decreasing with the same intensity as for men (especially in Southern Europe).

Alcohol

According to Eurostat statistics (8) on causes of death, the absolute number of deaths due to alcoholic abuse (including alcoholic psychosis) in 1995 was 8 831 for men and 2 297 for women in the EU. Apart from these, a substantial number of deaths are related to alcohol abuse (such as some traffic accidents or liver cirrhosis) and are not included in this total. The risk of cardiovascular disease can also be related to alcohol intake. Alcohol drinking is also strongly associated with the risk of primary liver cancer; it increases the risk of upper digestive and respiratory tract neoplasms, and there is some epidemiological evidence linking alcohol drinking to cancers of the colon and of the female breast. According to sales figures from each domestic market, the World Drinks Trend has calculated the average litres per person older than 15 of pure alcohol available on the market (beverages calculated according to their alcohol volume).

Home and Leisure Accidents

According to the data coming from the EHLASS (European Home and Leisure Accident Surveillance System), an estimated 430 000 home and leisure accidents occurred in the EU in 1995 (243 000 to men and 190 000 to women).

Different types of national collection of data hamper comparisons between countries. For the whole of the EU, in the case of men and according to the place of the accident, it is estimated that accidents at home (32%) were the most frequent followed by sporting accidents (18%), around the home (12%), in transport areas (11%) and in educational areas (7%).

Boys less than five years old accounted for 13% of cases and men over 65 years for 6% of cases. In the case of women, accidents at home (46%) were the most frequent followed by accidents in transport areas (14%), around

The 1995 Eurobarometer study also provided data on the number of cigarettes smoked per day and the results indicate that 30% of smokers were heavy smokers (>20 per day) and 2% were very heavy smokers (>40 per day). The highest proportions of heavy smokers are to be found in Greece, Denmark, Belgium and the UK.

The EU average was 9.4 litres in 1996. Results show that Sweden, the UK and Finland had the lowest average alcohol sold with 7-9 litres per capita and year. France and Luxembourg had higher sales (about 15 litres, per capita), and the remaining EU countries sold between 10-12 litres. No other recent statistics on the number of drinkers or patterns of consumption are available at European level at present. According to the HBSC study, boys and girls (15 years of age) admitted to drinking alcohol at least once a week in 1997-98. In Greece more than 50% of boys admitted to drinking, in comparison to 31% of girls. Alcohol consumption is generally a lot higher for boys than girls. Children in Finland consume less alcohol than their European counterparts, 8% girls admit to drinking and only 11% boys.

home (10%), during sport (10%) and in educational areas (7%). Girls less than five years old accounted for 12% of cases and women over 65 years for 16% of cases.

According to the type of activity for men, it is estimated that accidents at play and leisure (30%) were the most frequent followed by sports (12%), DIY (do-it-yourself) activities or gardening (8%) and other educational activities (7%). For women, accidents on play and leisure are also the most frequent (31%), followed by basic personal needs (12%) and household accidents (10%).

The most frequent type of injury in the case of men is open wounds and cuts (25%) followed by contusions (23%), fractures (13%) and distortions (9%). In the case of women, it is contusions (25%) followed by open wounds and cuts (18%), fractures (17%) and distortions (10%).

Road Traffic Accidents

The number of deaths caused by road accidents can be used as an indicator to assess the safety as result of a complex interaction of quality of road, quality of cars and human behaviour. All accidents are considered here including pedestrians, cyclists, motorists and passengers. However, despite the existence of an international standard, not all Member States record road deaths in the same way.

According to regional Eurostat data, in 1996, almost 40 955 people lost their lives on the roads of the EU. Between 1989 and 1997 the number of deaths due to road accidents declined by nearly 14% on average. There was an improvement in almost all Member States.

Data on the number of people injured by road accidents per 100 000 people in EU collected by the United Nations Economic Commission for Europe does not follow the same trends as the data on deaths. The sources and methods of collection are different, and comparisons of injury and death trends are not significant. The EU-average accident rate was 479.8 in 1997 - a slow decrease when compared with 1985 (498.7) and 1975 (544.7). Belgium (696.0), Portugal (688.3) and Austria (652.8) are

the most affected by road injuries. Finland (182.8) and Denmark (191.3) have the lowest average. There is a contrast in certain countries between the lowest average for road injuries in contrast and high one for road deaths. This is especially the case of Greece.

Deaths in road accidents are people who were killed outright or who died within 30 days as a result of the accident. They are collected by Eurostat (regional statistics) and can be calculated as a standard death rate (SDR) on the basis of WHO-reference population. All Member States should follow the international standard of 30 days established by the ECMT (European Conference of Ministers of Transport, an OECD body) but big differences remain in the time taken into account by Member States after an accident. The data on occurrence road traffic accidents with injury and data on persons injured in road traffic accidents are obtained from the Statistics on Road Traffic Accidents in Europe (United Nations Economic Commission for Europe). The data are generally in accordance with the commonly agreed definitions that have been worked out under the auspices of the Inland Transport Committee of the UN Economic Commission for Europe.

2.4 Priorities and targets for intervention

There are important common and less frequent determinants of musculoskeletal health that can be used to target preventative interventions at those at most risk or can be modified to prevent or reduce the impact of various musculoskeletal conditions. These include the various musculoskeletal conditions themselves, and identification and timely appropriate management of these will improve the outcome. Other determinants, which affect the occurrence or outcome of other major conditions, are age, obesity, poor nutrition, lack of physical activity/fitness,

smoking, excess alcohol and accidents and injuries. These determinants account for a major burden of disease and are important targets for modification with the potential for enormous health gain, not least for musculoskeletal health. There are other determinants of musculoskeletal health previously given in this part of the report, the modification of which if possible will reduce burden of these conditions. The evidence for this and recommended strategies are considered in the subsequent parts of this report.

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Part 3

What Can Be Done

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3.1 Introduction

Strategies have been developed that aim to reduce the burden of musculoskeletal conditions. These are based on evidence and are considered to be feasible to implement across the European Community.

The musculoskeletal conditions that are considered are osteoarthritis, rheumatoid arthritis, non-specific back pain, osteoporosis and trauma. All aspects of prevention, treatment and rehabilitation have been considered. Common themes across the different musculoskeletal conditions have been identified to allow these strategies to be developed so that they will have the broadest benefit for people with musculoskeletal conditions as a whole. To achieve this approach a template has been used to identify evidence for the individual conditions from which recommendations and strategies have been developed.

Interventions have been identified that have been shown to be effective from randomised controlled trials, (RCT's), systematic reviews and evidence based guidelines. There is a large resource of evidence for a wide variety of

interventions for the prevention and management of musculoskeletal conditions. Many guidelines and systematic reviews have already been developed from the critical review of this evidence-base. Priority has therefore been given to evidence from existing guidelines and systematic reviews providing they met agreed quality standards.

Recommendations for the use of these interventions have been developed on the basis of this evidence and expert opinion as to what is likely to be of benefit in clinical practice.

Strategies have been developed for the prevention and management of musculoskeletal conditions (Part 4) that incorporate these recommendations and consider additional health benefits and feasibility of implementation. The implications for the implementation of these strategies for the different stakeholders has also been considered. How to implement these strategies is proposed in Part 5.

3.2 Definitions

The aim is to make recommendations for strategies and policies that will benefit all musculoskeletal conditions – from their prevention to their management to improve outcomes. A template approach has been used with clear definitions to be able to look for commonality in the recommendations. Definitions have been agreed for the

The populations

It is important in any strategy for it to be clear who it is aimed at. It is also important to only make recommendations for an intervention if the evidence has been shown to be applicable to the target population. The different populations have therefore been defined for each condition. There is the *population as a whole* who are the target for strategies to prevent the onset of any musculoskeletal condition. Prevention is more cost effective if targeted at those who are at *high risk*. There are also those with the conditions already established. Many of these conditions are chronic and progressive and recommendations have been developed for the different

The outcomes

Any health condition affects an individual in a variety of ways, each of which may need a different approach to prevention and management. A standardised approach has therefore been taken to identify and agree the key outcomes of each of the conditions using the concepts of the World Health Organisation (WHO) International Classification of Functioning (ICF) (Figure 1.4 page 28). The agreed outcomes were defined in terms of the

The interventions

There are a wide variety of interventions for the prevention and management of musculoskeletal conditions. They can however be considered in four main groups – lifestyle, pharmacological, surgical and rehabilitative. Within these

different conditions of the populations from which the evidence has been identified and for whom it is applicable; of the outcome goals for which evidence has been sought; of the interventions that may be recommended; and of the targets for recommended interventions.

stages where this is appropriate. This is from the *early stages* when the condition may be reversible to the *late stages* when they may be associated with significant disability.

Therefore for each musculoskeletal condition the “at risk population” has been defined. The different stages of the conditions that are relevant to prevention and treatment in terms of *early and / or mild disease* to *severe and / or longstanding disease* have also been defined. The precise definition of these stages varies between the conditions. For example, in the case of osteoporosis these stages are defined as *osteoporosis* and *established osteoporosis*.

symptoms and *tissue damage* associated with the condition, and the effect on the individual in terms of *limitation of activities* and *restriction of participation*. For example, for osteoporosis the agreed outcomes for tissue damage are fracture and bone density whilst pain is the most important symptom. Limitation of activities and restricted participation is measured using a generic and disease-specific quality of life instruments.

there are common themes that can be identified that have allowed a common set of recommendations to be developed (see table 3.1).

Table 3.1 Interventions for the prevention and management of musculoskeletal conditions

Interventions		Examples
Lifestyle Interventions		Diet, weight, exercise, smoking, alcohol
Pharmacological Interventions	Symptoms	Simple analgesics, anti-inflammatory analgesics, antidepressants, muscle relaxants etc
	Disease process	Disease modifying therapies
	Local treatment	Intra-articular steroids, topical therapies
	Supplements	Minerals, oils, vitamins (E, C, D), other (eg glucosamine)
Surgical Interventions	To modify	Tendon transfer, soft tissue procedures around a joint, spinal fusion, osteotomy
	To repair	Fracture fixation, bone grafting, ligament repairs
	To remove	Meniscectomy, discectomy, excision arthroplasty
	To replace	Arthroplasty (cemented, uncemented, unipolar, bipolar, total, different surfaces etc)
Rehabilitative Interventions (1)	To treat impairment	Angular joint mobilisation (active ROM-exercise, assisted ROM-exercise, passive ROM-exercise) Joint play techniques (mobilisation (gliding of joint surfaces), impulse mobilisation, traction) Joint immobilisation (rest, selective functional immobilization, non-selective functional immobilisation, change of vector of forces) Muscle techniques (restoring muscle balance, strengthening exercises, flexibility training) Neuromuscular rehabilitation (co-ordination and balance, recreational activities, biofeedback, relaxation techniques, reflex therapies and acupuncture) Physical fitness (aerobic fitness and endurance) Joint protection Physical modalities (therapeutic heat, therapeutic cold, hydrotherapy, massage, electrotherapy) Body awareness and image
	To compensate for impairments	Braces Aids and devices Modifying the environment or the nature of a task Vocational counselling Support services Social interventions (incl. insurance benefits)
	To recognise and address personal factors	Behaviour therapy Education Psychological support Self-Management

The targets for interventions

Targets for the recommended interventions for each musculoskeletal condition and relevant population have been identified. These relate to the defined outcomes that were agreed to assess the evidence for each condition and focus around reducing symptoms, preventing tissue

damage and reducing disability. For example, the targets for osteoporosis are to prevent fractures and improve quality of life by maximising bone mass, preventing falls, reducing pain and disability.

3.3 Methodology

Identifying the evidence

A standardised search strategy has been undertaken in the areas of osteoporosis, osteoarthritis, back pain, rheumatoid arthritis and traumatology for both guidelines and systematic reviews using MEDLINE and EMBASE.

The search strategy is outlined in Appendix I. Publications from 1995 until October 2002 were initially considered. This identified over 1800 papers associated with guidelines and over 300 systematic reviews. A search of the World Wide Web (Google) was undertaken which identified other guidelines and reviews. In addition relevant governmental, clinical and research organisations within Europe were contacted asking for any guidelines that were available in the area of prevention or management of musculoskeletal conditions. To ensure current evidence is considered in developing the recommendations, a second literature search was undertaken for publications between October 2002 and October 2003. This followed the same search strategy (Appendix 1) of MEDLINE and EMBASE, a search of the World Wide Web (Google) and contact with members of the expert groups asking for any recent relevant meta-analyses, systematic reviews or guidelines.

An initial filter was carried out of guidelines and systematic reviews identified from the searches covering

1995 – 2002 to remove irrelevant papers and a hand search carried out to identify and include missed papers, including major clinical studies. This resulted in an initial list of guideline and systematic review papers and these were classified into the following groups, Osteoarthritis, Rheumatoid Arthritis, Back pain, Osteoporosis and Traumatology.

The abstracts of these papers were made available on the web and the experts from each condition-based group undertook an initial screening process using an agreed checklist (Appendix 2). A shortlist of guidelines and systematic reviews was derived which were then appraised using the AGREE tool for guidelines and the Cochrane criteria for systematic reviews.

Guidelines and systematic reviews identified from the searches covering October 2002 – October 2003 were similarly filtered and any used as part of the evidence-base for the report met the same criteria.

This process resulted in the final selection of papers which have been appraised and used to develop the recommendations and are listed in Part 3.

Appraising the evidence

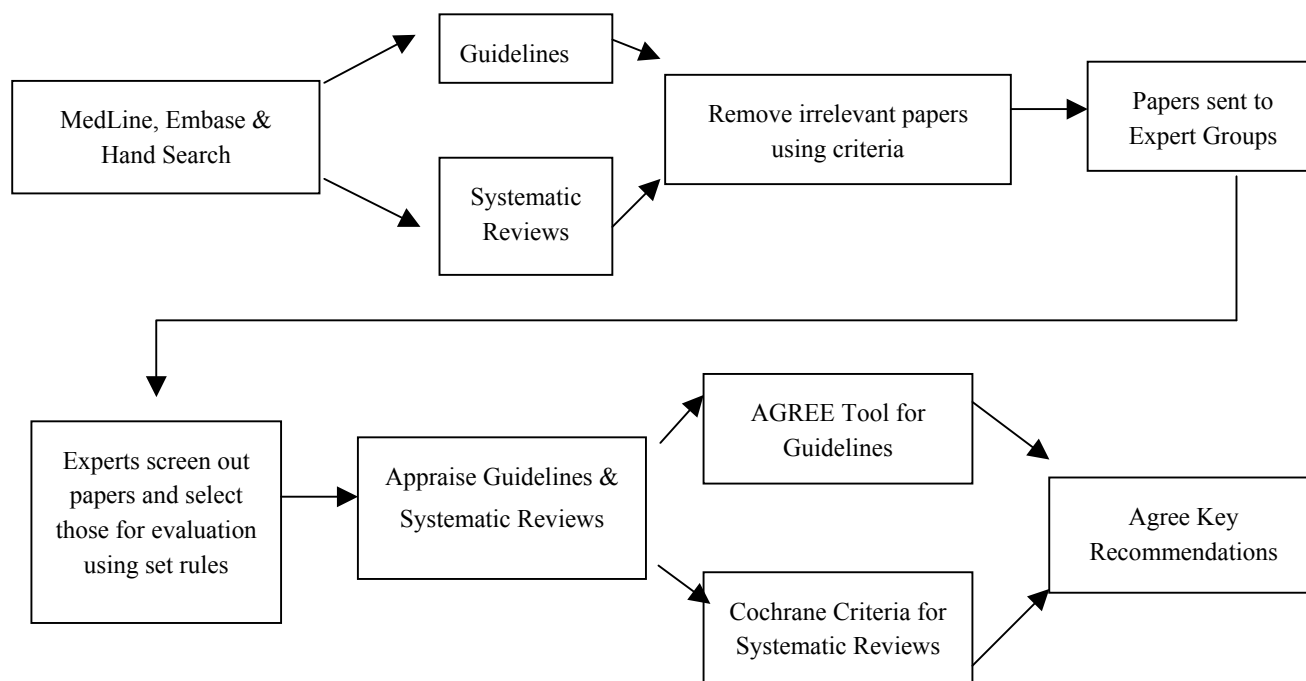
Interventions have been assessed for robustness and effectiveness. The assessment followed the process outlined in the flow chart below. The full process is outlined in Appendix 3.

Once the evidence was appraised, the evidence from the various sources for any intervention was graded using the index in Table 3.2 adapted from Eccles (1).

This considers the quality of the evidence; whether there is sufficient evidence to make a grading; whether there is

inconsistency of data and finally the nature of effect, whether positive, negative or if there is evidence of no effect. The population in which the evidence has been obtained is also considered.

The lack of direct comparative trials limits the ability to comment on size of effect in some cases. The strategies that are recommended in this report take the effect size into consideration where possible.

Figure 3.1 Methodology of Identification and Appraisal of the Evidence**Table 3.2 The grading of the evidence (adapted from Eccles et al (2))**

Grading of the Evidence	
Categories of Evidence	
Ia	Evidence from meta-analysis of randomised controlled trials
Ib	Evidence from at least one randomised controlled trial
IIa	Evidence from at least one controlled study without randomisation
IIb	Evidence from at least one other type of quasi-experimental study
III	Evidence from descriptive studies, i.e. comparative studies, correlation studies and case-control studies
IV	Evidence from expert committee reports or opinion, or clinical experience of respective authority or both
#	Inconsistent findings from research
IE	Inadequate evidence from which to make a grading
The nature of the effect	
+	Positive effect
0	Evidence of no effect
-	Negative effect

How the evidence is presented

The evidence is presented separately for the different musculoskeletal conditions and for the different categories of intervention. It is presented in tables for each category of intervention and then this is expanded in the subsequent text. The population group that the evidence applies to is given.

The tables of evidence given in this report can be interpreted as follows: the rows in the table list the type of intervention being assessed and the population for which the evidence applies. The columns in the table (Table 3.3)

represent the outcomes agreed for that condition against which the interventions have been assessed. The level of evidence that is currently available from the selected guidelines and systematic reviews is given in the cells along with the nature of the effect and any comments about quality of data. For example, the shaded cell explains that there is evidence from at least one other type of quasi-experimental study that diet has a positive affect on pain caused by osteoarthritis in people suffering from end stage osteoporosis (represented by shaded cell).

Table 3.3 Example: Lifestyle Intervention – Osteoarthritis

Interventions	Aims of Intervention		
	Function / Structure		Activity & Participation
	Tissue damage	Symptom	
	x-ray stage	pain	QOL
Weight reduction			
Normal population	IV+	IV+	IV+
At risk population	IV+	IV+	IV+
Early stage osteoarthritis	IV+	II b +	IV+
Late stage osteoarthritis	IV+	I b +	I b +

From Evidence to Recommendations

The recommendations have been developed by reviewing the agreed evidence-based interventions and by expert opinion. A defined framework has been used to facilitate the development of recommendations so that will be similar for all the different musculoskeletal conditions and will allow common messages to be developed.

This framework considers the key targets that need to be addressed by the different evidence-based interventions. It also considers the different conditions and the populations that should be targeted. Any recommendations must also

take into account any associated side effects or risks of the interventions.

For example, the evidence for lifestyle interventions has been considered in light of the effect of the prevention or development of osteoarthritis in the whole population, in the “at risk population”, those with the early stage of the condition and those at a late stage. In addition the rationale behind the intervention, its evidence base and the evidence of effect on key outcomes were made explicit. The recommendations have been graded according to Table 3.4.

Table 3.4 Grading of the recommendations (2)

Grading of recommendations	
A	Directly based on category I evidence
B	Directly based on category II evidence or extrapolated from category I evidence
C	Directly based on category III evidence or extrapolated from category II evidence
D	Directly based on category IV evidence or extrapolated from category III evidence

Limitations of the evidence

The methodology to identify and grade evidence that has been used to develop guidelines is weighted towards randomised control trials. In the context of musculoskeletal conditions, many of which are chronic with long term consequences for which interventions are often complex, there is a paucity of such evidence and recommendations have to be made on the basis of observational studies and expert opinion. Although this means the grading of recommendations appears to be lower, it does not mean that

the potential benefit is any less. It just reflects the nature of the evidence base. For example, total hip replacement for osteoarthritis is a highly cost effective intervention yet there are no randomised control trials to demonstrate its benefit as these would be inappropriate to perform. Likewise it is difficult to obtain such randomised control trial evidence for many lifestyle changes. Expert consensus has therefore been used where necessary to develop the recommendations.

Summary

For each condition, evidence has been sought for each of the different interventions against the agreed outcomes in the defined populations. From this recommendations have

been made aimed at the agreed targets for the evidence-based management of the different stages of the conditions.

The evidence of what can be done

In the next sections the evidence of what can be done is specifically reviewed for the key conditions – osteoarthritis, rheumatoid arthritis, back pain, osteoporosis, and musculoskeletal injuries.

3.4 Osteoarthritis

Key Definitions

Populations

Osteoarthritis, defined radiologically, of the hip affects 3% of the population 55-74yrs, knee osteoarthritis 10%, foot osteoarthritis 40% and hand osteoarthritis 70%. One in 10 of the population who are 60 years or older have significant clinical problems that can be attributed to osteoarthritis. The prevalence increases with age and most people over 75 years will be affected. The whole population should therefore be considered at risk. The risk is highest in the elderly, the obese, those with abnormal biomechanics or those who have previously injured the joint. The clinical manifestation is joint pain that is associated with loss of function, limitation of activities and restricted participation. Symptoms are initially episodic associated with physical activity but if it progresses the pain becomes more persistent and the disability increases. In the early stages, radiological changes may be absent or minimal but these may progress.

The populations that have been used to assess the evidence and that form a basis of the recommendations and strategies are therefore defined as:

Normal:	the whole population
At risk:	age over 50 years, obese, abnormal biomechanics or previous joint damage
Early stage:	those suffering from episodic pain and/or stiffness of knee, hip or hand(s)
Late stage:	people with impairment and/or changes on X-rays

Outcome measures against which to assess the evidence

In order to assess the evidence and develop recommendations key outcome measures have been defined. These are:

For symptoms:	Pain
For tissue damage:	X-ray scores or other imaging techniques
Activity / Participation:	Disease specific instruments: HAQ, WOMAC. Generic instruments: EuroQol, SF 36, NHP

Targets for intervention

Targets that are most important in the prevention or management of osteoarthritis are to:

- Prevent radiological progression
- Reduce pain
- Reduce disability

Interventions

The evidence for different interventions is considered in the context of the agreed targets for the prevention and treatment of osteoarthritis and for the populations that the evidence applies to. It is presented in Tables 3.4.1, 3.4.2, 3.4.3, and 3.4.4. The evidence for these recommendations is from selected and appraised guidelines, systematic reviews and major clinical studies (see list on page 98).

Lifestyle Interventions

There are various lifestyle factors that increase the risk of developing osteoarthritis, increase its rate of progression and can increase the pain and functional limitations associated with the disease. By targeting lifestyle interventions to avoid or reverse these risks, then it is possible to have a positive effect on the key outcomes of preventing damage, preventing or reducing pain and improving function and activities.

Preventable or modifiable risk factors

Obesity:

There is a higher incidence of knee osteoarthritis in overweight people, this association is stronger in women than in men. Obesity is also associated with more rapid progression of the disease. There is evidence that appropriate weight loss can reduce the symptoms of osteoarthritis.

Mechanical aspects of the joint:

There is increasing evidence that mechanical aspects are important in osteoarthritis: joint laxity, decreased proprioception and malalignment may predispose to osteoarthritis. Malalignment also predicts worse surgical outcome.

Abnormal loading of articular cartilage:

There is evidence that links cartilage stiffness to the incidence of osteoarthritis.

Acute joint injury and joint deformity: joint dysplasia, fractures of articular surfaces, tears of *menisci* or ligaments precede the development of osteoarthritis in a high percentage of affected joints.

Occupational factors:

There is good evidence that certain occupations are associated with the incidence of osteoarthritis. Examples are osteoarthritis of the hips in farmers and knee

osteoarthritis in people working in a crouching or squatting position.

Sports participation:

High-intensity, acute, direct joint impact-sports (football, soccer) is associated with the incidence of osteoarthritis; however, moderate regular running might even be protective

Muscle weakness:

Mostly secondary; sometimes precedes osteoarthritis, e.g. quadriceps weakness.

Nutritional factors:

There are a number of nutritional factors that impact on the risk and progression of osteoarthritis. A high intake of vitamin C is associated with lower risk of knee pain and vitamin D was reported to have a positive relation with disease progression although it has no effect on the incidence of osteoarthritis.

Hormonal status:

There is some evidence to suggest that oestrogens have protective effect on the prevalence of osteoarthritis. However, this protective effect may be counterbalanced by an associated increase in bone mass which impacts on the incidence and progression of the disease.

Non-modifiable risk factors

Ethnicity:

There is some suggestion that ethnicity may be a risk factor but the data are inconsistent and could be biased by other risk factors.

Genetics:

Genetics plays an important role in the incidence of osteoarthritis but the impact varies depending on the site of the disease. For osteoarthritis of hands and hip, up to

50% of the risk of developing osteoarthritis is attributable to genetic factors. However, for osteoarthritis of the knee this association is lower. The risk of osteoarthritis following knee injury is increased if there is a family history of osteoarthritis, confirming that the importance of interactions between the environment and the genome.

Evidence

Table 3.4.1. summarises the level of evidence from selected and appraised guidelines, systematic reviews and major clinical studies for lifestyle interventions on the target outcomes (see list on page 98).

Table 3.4.1

Lifestyle Interventions	Aims of Intervention		
	Function / Structure		Activity & Participation QOL e.g. HAQ
	Tissue damage x-ray stage	Symptom pain	
Diet (other than weight reduction)	III 0	III 0	III 0
Weight reduction			
Normal population	IV+	IV+	IV+
At risk population	IV+	IV+	IV+
Early stage population	IV+	II b +	IV+
Late stage population	IV+	I b +	I b +
Recreational exercise			
Normal population	IV+	IV+	IV+
At risk population	IV+	IV+	IV+
Early stage population	IV+	I a +	I a +
Late stage population	IV+	I a +	I a +
Other: sports	As recreational exercise, see above		
Prevention of injuries	IV+	IV+	IV+

Ia – IV grading of evidence	Nature of effect:	+ positive;	0 evidence of no effect;	- negative effect
# inconsistent findings	IE inadequate evidence			

Effect on Key Outcomes

A regime of good diet or a weight reduction programme can be beneficial in preventing obesity and injuries. This will reduce the risk of developing osteoarthritis and its progression.

The leading of an active lifestyle can prevent the development of osteoarthritis as defined by radiological change (Level IV).

Leading an active lifestyle coupled with a healthy diet to avoid obesity can prevent progression of osteoarthritis as defined by radiological change (Level IV).

A number of lifestyle interventions such as weight reduction (Level Ib - IV) and aerobic conditioning (Level Ia-IV) can reduce pain associated with osteoarthritis.

Reducing pain (see above) (Level Ia) and better aerobic condition (Level Ib) can improve and maintain function.

Prevention of injuries (sports, occupational, traumatic etc) may prevent the development of osteoarthritis (Level IV).

Recommendations : Lifestyle Interventions

To prevent osteoarthritis in the whole population there is evidence to recommend programmes that promote adequate physical activity (B), the avoidance of obesity (B) and the prevention of injuries due to overuse or accidents (D).

For the at risk population, the recommendations are to participate in adequate physical exercise (B), avoid obesity (B) and the prevention of injuries due to overuse or accidents (D).

To reduce the impact of osteoarthritis for those with the condition there is evidence that pain can be reduced by physical activity (A) and weight reduction (B) and that physical functioning can be maintained or restored and radiological progression reduced by physical activity (B) and weight reduction (B).

Pharmacological Interventions

Rationale

Osteoarthritis is characterised by pain and joint damage, which has a negative impact on functional ability. Pharmacological therapies reduce pain and may reduce joint damage. Pain control improves function, activities and participation.

Definitions

Simple analgesics, anti-inflammatories (NSAIDs) and topical therapies: Drugs that aim to reduce pain and improve function in osteoarthritis without affecting the disease process

Disease modifying drugs: Drugs that aim to modify the disease process itself, usually by modifying cartilage or bone metabolism

Intra-articular steroids and Hyaluronic acid: Injections into the joint to relieve symptoms and improve function.

Evidence

Table 3.4.2 summarises the level of evidence from selected and appraised guidelines, systematic reviews and major clinical studies for pharmacological interventions on the target outcomes (see list on page 98).

Table 3.4.2

Pharmacological Interventions	Aims of Intervention		Activity & Participation QOL e.g. HAQ
	Function / Structure		
	Tissue damage x-ray stage	Symptom pain	
Simple analgesics			
Early stage	0	Ia +	Ia +
Late stage	0	Ia +	Ia +
Anti-inflammatories			
Early stage	0	Ia +	Ia +
Late stage	0	Ia +	Ia +
Antidepressants			
Early stage	0	IV +	IV +
Late stage	0	IV +	IV +
Muscle relaxants			
Early stage	0	IV +	IV +
Late stage	0	IV +	IV +
Disease modifying therapies:			
glucosamine sulphate			
Early stage	Ib+ #	Ia +	Ia +
Late stage	Ib+ #	Ia +	Ia +
chondroitin sulphate			
Late stage	Ib+ #	Ia +	Ia +
Hyaluronic acid			
Late stage	0	Ib +	Ib +
IA steroids			
Early stage	0	Ib +	Ib +
Late stage	0	Ib +	Ib +
Topical NSAIDs and capsaicin			
Early stage	0	Ib +	Ib +
Late stage	0	Ib +	Ib +
Minerals	0		
Oils	0	III 0	0
Vitamins C and D	IV+*	IE	IE

* If the patient is deficient

Ia – IV grading of evidence	Nature of effect:	+ positive; 0 evidence of no effect; - negative effect
#	inconsistent findings	IE inadequate evidence

Effect on Key Outcomes

There is no evidence that pharmacological interventions can prevent osteoarthritis, as defined by radiological changes.

Disease modifying therapy, such as glucosamine sulphate (Level II), can perhaps prevent the progression of osteoarthritis, as defined by radiological change.

The use of simple analgesics, anti-inflammatories, disease modifying therapies, hyaluronic acid, intraarticular steroids and topical applied anti-inflammatories and capsaicin can reduce pain as a result of osteoarthritis (Level Ia-III).

The use of simple analgesics, anti-inflammatory drugs, disease modifying therapies, intra-articular steroids and topical applied anti-inflammatory drugs and capsaicin can improve / maintain function (Level Ia-IV).

Recommendations : Pharmacological Interventions

There are no recommendations for the use of pharmacological interventions as a *preventative measure* against osteoarthritis.

To reduce the impact of osteoarthritis for those with the condition there is evidence to support the use of analgesics, NSAIDs, SYSADOAs, (symptomatic slow acting drugs osteoarthritis) topical NSAIDs and capsaicin, intraarticular steroids are effective for pain reduction (A) and also for maintaining or restoring function (B). SYSADOAs drugs are also effective in *preventing radiological progression*, but there are methodological questions to be resolved (D).

Surgical Interventions**Rationale**

Osteoarthritis results in altered biomechanics and joint damage that can result in pain and disability. Surgical correction of these abnormalities can relieve pain and improve function.

The biomechanics of an injured joint can be restored by surgical interventions that repair damaged ligaments or menisci.

The biomechanics of an osteoarthritic joint can be modified by surgical osteotomy in order place less stress through damaged compartments of a joint and hence reduce pain and disability.

For severely damaged joints, partial or total replacement of the joint is now possible for all those joints that are commonly affected by osteoarthritis.

Evidence

Table 3.4.3 summarises the level of evidence from selected and appraised guidelines, systematic reviews and major clinical studies for surgical interventions on the target outcomes (see list on page 98).

Table 3.4.3

Surgical Interventions	Aims of Intervention		Activity & Participation QOL e.g. HAQ
	Function / Structure		
	Tissue damage x-ray stage	Symptom pain	
Tidal irrigation/lavage			
Early stage	I b 0	Ib + #	Ib + #
Late stage	I b 0	Ib + #	Ib + #
Chondrocyte/cartilage repair			
Late stage	IE	IE	IE
Resection arthroplasty, arthrodesis			
Late stage		III+	III +
Arthroplasty			
Late stage		III +	III +
Osteotomy			
Early stage	III+	III +	III +
Late stage	III+	III +	III +
Repair of ligaments, torn meniscus			
At risk	III+	IV +	IV +
Early stage	III+	IV +	IV +
Joint distraction	Uncommon procedure		
Late stage		II b +	II b +

note : detection and treatment of hip dysplasia may prevent later osteoarthritis of the hip

1a – IV grading of evidence	Nature of effect:	+ positive; 0 evidence of no effect; - negative effect
	# inconsistent findings	IE inadequate evidence

Effect on Key Outcomes

There is a consensus that the repair of biomechanical disorders (re-alignment or repair of ligaments) in the population at risk can reduce pain and improve function (Level IV).

Detection and treatment of hip dysplasia may prevent later osteoarthritis of the hip (Level IV).

Various surgical techniques that include osteotomy and repair of ligaments and torn meniscus can prevent the progression of osteoarthritis, as defined by radiological change (Level III-IV).

Arthroplasty, arthrodesis, and osteotomy reduce pain (Level II-IV).

Arthroplasty and osteotomy improve and maintain function (Level II-IV).

Recommendations : Surgical Interventions

There are no recommendations for surgical interventions that *prevent osteoarthritis in the whole population*.

To reduce the impact of osteoarthritis for those with the condition there is evidence to support the following. Pain can be reduced by arthroplasty (C) and joint preserving surgery (osteotomy) (C). Radiological progression can be prevented by osteotomy. Function can be maintained or restored by either arthroplasty (C) or osteotomy (C).

Rehabilitative Interventions

Rationale

Osteoarthritis is commonly associated with limited function that can be improved with a wide variety of rehabilitative interventions aimed at the whole person and not just the affected structure.

Evidence

Table 3.4.4 summarises the level of evidence from selected and appraised guidelines, systematic reviews and major clinical studies for rehabilitative interventions on the target outcomes (see list on page 98).

Table 3.4.4

Rehabilitative Interventions	Aims of Intervention		Activity & Participation QOL e.g. HAQ
	Function / Structure		
	Tissue damage x-ray stage	Symptom pain	
Joint specific exercises			
Early stage		I b +	I b +
Late stage		I b +	I b +
Joint immobilisation			
Late stage		IV+*	
Physical Fitness			
Early stage		I b +	I b +
Late stage		I b +	I b +
Physical modalities: e.g. heat / cold packing			
Early stage		IV+	IV+
Late stage		IV+	IV+
Braces, aids and devices (includes insoles, walking aids)			
Early stage		I b +	I b +
Late stage		I b +	I b +
Modifying the environment: adaptations at home, work			
Late stage		IV# 0 to +	IV# 0 to +
Support services, social interventions			
Late stage		IV# 0 to +	IV# 0 to +
Education, self-management etc			
Early stage		I a +	I a +
Late stage		I a +	I a +

* in acute flares

Ia – IV grading of evidence	Nature of effect:	+ positive;	0 evidence of no effect;	- negative effect
#	inconsistent findings	IE	inadequate evidence	

Description of interventions

Joint specific exercises: Joint specific exercises are meant to train individual muscles or groups of muscles; e.g. for osteoarthritis of the knee quadriceps training improves stability of the knee and decreases as such the symptoms of knee OA.

Joint immobilization: Late stage osteoarthritis of e.g. the carpo metacarpal joint of the thumb can be very painful; by joint immobilization procedures this pain can be reduced, though function will of course decrease.

Physical fitness: Physical fitness improves aerobic and general condition of the patients. Therefore they are more stable in activities of daily life and maybe able to perform tasks easier, without overusing.

Physical modalities e.g. heat/cold packing: Symptoms of osteoarthritis are sometimes based on reactive muscle hypertony; by applying heat this muscle hypertony or muscle spasm can be reduced. When some inflammation is present cold packing may reduce symptoms.

Braces, aids and devices may reduce the mechanical impact of different activities and therefore reduce the mechanical load of the involved joints. The same holds for *adaptations* at home and at work.

Education and self-management are very important to teach patients the best way to use his or her joints, to prevent overuse, to use their energy in the most adequate way.

Effect on Key Outcomes

Rehabilitation interventions, notably joint specific exercises, physical fitness programmes, the use of braces aids and devices, as well as participation in self-management programmes can improve activity and participation, and thus improve an active lifestyle (Level I).

Joint specific exercises, physical fitness, (Level I) the use of braces, aids and devices (insoles) (Level III), the use of walking supports (Level IV)) and the participation in self-management programmes can reduce pain associated with osteoarthritis.

There is no evidence that rehabilitation interventions can prevent the development of osteoarthritis, as defined by radiological changes.

There is no evidence that rehabilitation interventions can prevent the progression of osteoarthritis, as defined by radiological changes.

Recommendations : Rehabilitative Interventions

To prevent osteoarthritis developing in the normal or at risk population, the main recommendations are to maintain a level of physical fitness (B).

To reduce the impact of osteoarthritis for those with the condition, pain can be reduced (A) and function maintained or restored (A) by the use of self-management programmes, joint specific exercises, physical modalities, braces, aids and devices.

Key Recommendations for Osteoarthritis

Key recommendations for prevention and treatment of osteoarthritis	
Population	Recommended Intervention
Whole population	People should maintain a level of physical fitness (B), to avoid obesity (B), and injuries due to overuse or accidents should be prevented (D) to prevent osteoarthritis in the population.
At risk population	Those at risk of osteoarthritis should participate in adequate physical exercise (B), to avoid obesity (B), and injuries due to overuse or accidents should be prevented (D) to prevent osteoarthritis in the at risk population.
Those with osteoarthritis	<p>For those with osteoarthritis it is recommended that:</p> <p>Pain can be reduced and function can be maintained or restored by :</p> <ul style="list-style-type: none"> • physical activity (A) and weight reduction (B) • participation in self-management programmes (A) • the use of analgesics, NSAIDS, SYSADOAs (symptomatic slow acting drugs osteoarthritis), topical NSAIDS , capsaicin, intra-articular steroids (A) and intra-articular hyaluronic acid (A) • joint specific exercises, physical modalities, braces, aids and devices (A) • arthroplasty (C) • joint preserving surgery (osteotomy) (C) <p>Progression of radiological changes may be prevented by:</p> <ul style="list-style-type: none"> • physical activity • weight reduction • SYSADOAs drugs (D) • osteotomy (C).

Sources of data used to support recommendations

Guidelines

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3.5 Rheumatoid arthritis

Key Definitions

Populations

Rheumatoid arthritis affects between 0.3 and 1% of the population with women affected about 3 times more frequently than men. The peak age of onset is between 35 and 45 years. However males and females of all ages are at risk. It is an inflammatory disease principally affecting the synovial lining of joints and results in erosion of the articular surface with pain and loss of function. It also causes more systemic problems with weight loss, anaemia and loss of vitality. Initially there may be inflammation in several joints, which in some progresses to typical rheumatoid arthritis and in others it resolves. Once the characteristics of rheumatoid arthritis have fully developed, it is usually persistent and progressive. It has a major effect on function from the onset, initially due to inflammatory disease activity and later due to joint damage and deformities.

The populations that have been used to assess the evidence and that form a basis of the recommendations and strategies are defined as:

Normal:	the whole population at all ages
At risk:	that population with early inflammatory arthritis using diagnostic criteria. (3)
Early disease:	that population with early stage rheumatoid arthritis as defined by the ACR criteria. (4)
Established disease:	the population that has rheumatoid arthritis as defined by the ACR criteria. (4)
Late stage disease	the population that has late stage rheumatoid arthritis as defined by Steinbocker functional class IV (5).

Outcome measures against which to assess the evidence

In order to assess the evidence and develop recommendations key outcome measures have been defined. These are:

For symptoms:	Pain (visual analogue scale), swollen joint count, tender joint count, acute phase response and general health (visual analogue scale).
For tissue damage:	X-ray score, MRI, BMD primary as measured by x-ray but data on MRI/BMD will also be indicated (see fig text when appropriate)
Activity / Participation:	Disease specific instruments: HAQ
Generic instruments:	SF36, NHP, EuroQol

Target for interventions

Targets that are most important in the prevention and management of rheumatoid arthritis are to:

- Reduce pain and inflammation
- Reduce disability
- Prevent radiological damage and progression
- Reduce appearance of co-morbidities

Interventions

The evidence for different interventions is considered in the context of the agreed targets for the prevention and treatment of rheumatoid arthritis and for the populations that the evidence applies to. It is presented in Tables 3.5.3, 3.5.4, 3.5.5, and 3.5.6. The evidence for these recommendations is from selected and appraised guidelines, systematic reviews and major clinical studies (see list on pages 107-109).

Lifestyle Interventions

Rationale

Rheumatoid arthritis is a chronic inflammatory joint disease with an annual incidence rate between 25 and 50 per 100,000 individuals. Most likely, a combination of genetic and environmental factors, such as infections, reproductive or hormonal and factors related to life style, is responsible for the disease.

Various lifestyle factors may increase the risk of developing rheumatoid arthritis, examples are smoking and obesity. These factors also impact on the progression of the disease and can lead to an increase in the associated pain and functional limitations of rheumatoid arthritis.

Table 3.5.1 Risk factors for occurrence and chronicity of rheumatoid arthritis

	Occurrence	Chronicity / severity
<i>Individual factors</i>	Gender (female) Smoking Family history of Rheumatoid Arthritis	Obesity (BMI 30) Smoking
<i>Psychosocial factors</i>	No Evidence	Lower educational level
<i>Occupational factors</i>	No Evidence	Adverse social & economic circumstances

Evidence

Table 3.5.2 summarises the level of evidence from selected and appraised guidelines, systematic reviews and major clinical studies for lifestyle interventions on the target outcomes (see list on pages 107-109).

Table 3.5.2

Lifestyle Interventions	Aims of Intervention		
	Function / Structure		Activity & Participation HAQ
	Tissue damage X-Ray Score	Symptom pain	
Smoking			
At risk population	III+		
Early disease	IV+		
Established disease	III+ (1)		
Late stage disease	IV+		
Obesity			
At risk		III+	
Early disease		III-	
Established disease		III-	
Late stage disease		III-	
Physical activity			
Established disease	IE	Not harmful	Iib+
Alcohol	IE		
Diet	IE		

Key: X-ray score = 1; BMD = 2; MRI = 3

Ia – IV grading of evidence	Nature of effect:	+ positive;	0 evidence of no effect;	- negative effect
# inconsistent findings	IE inadequate evidence			

Effect on Key Outcomes

A reduction or stopping of smoking can prevent the development of radiological damage and progression of rheumatoid arthritis (Level III).

Ensuring an appropriate body weight by following a healthy diet and maintaining physical activity can control pain in rheumatoid arthritis (Level III).

An appropriate physical exercise regime can improve or maintain function (Level IIb). It does not appear to exacerbate disease activity or radiological progression.

Recommendations : Lifestyle Interventions

To prevent early persistent inflammatory symmetric arthritis (PISA) progressing to rheumatoid arthritis with disability there is evidence to recommend smoking cessation. The effect of smoking on the occurrence and course of RA has been shown to remain for several years after stopping (C).

To reduce the impact of rheumatoid arthritis for those with the condition there is evidence to recommend physical activity (C). A total cessation or reduction in cigarette smoking will also reduce the impact of rheumatoid arthritis (C).

There is no evidence that *radiological damage* can be prevented or retarded by lifestyle interventions.

Pharmacological Interventions

Rationale

Rheumatoid arthritis is characterised by pain and joint damage, which result in the restriction of functional ability. It is possible to control joint damage and limit the effects of pain with pharmacological therapies with improvement in function, activities and participation.

Simple analgesics are used to manage pain in all stages of the disease often in combination with Non Steroidal Anti-inflammatory agents and other therapies to control the inflammatory process.

Non Steroidal Anti-inflammatory Agents have an instantaneous effect on the symptoms pain and stiffness of the disease without influencing the disease process.

Disease Modifying Anti Rheumatic Drugs have an effect on the disease process within weeks or months. The exact mechanism of action of these agents is not known. Examples of those commonly used are methotrexate and sulfasalazine. As these agents do not have a direct effect on the symptoms of the disease, they are initially given in combination with NSAIDs.

Biologicals: The growing insight in the pathogenesis of RA has made it possible to develop biological treatments which are restoring the imbalance in the inflammatory and anti-inflammatory response. In general the onset of response is within days and as with the DMARDs no direct effect on the disease symptoms is being observed. An example is anti TNF α therapy.

Glucocorticosteroids are used either intra-articularly or systemically. Glucocorticosteroid injections are given to suppress the inflammatory response in a single joint sometimes in combination with other systemic therapies. Systemic glucocorticosteroid therapy can be given orally or parenterally (intramuscularly or intravenously) in many different dosage schemes. Next to a symptom relieving anti-inflammatory effect recent studies have shown that they also do have an effect on the disease process.

Evidence

Table 3.5.3 summarises the level of evidence from selected and appraised guidelines, systematic reviews and major clinical studies for pharmacological interventions on the target outcomes (see list on pages 107-109).

Table 3.5.3

Pharmacological Interventions	Aims of Intervention		Activity & Participation HAQ
	Function / Structure		
	Tissue damage X-Ray Score	Symptom pain	
Simple analgesics			
Early disease population		Ia+	Ia+
Established disease		Ia +	Ia +
Late Stage disease		Ia +	Ia +
Anti-inflammatories			
Early disease		Ia+	Ia+
Established disease		Ia +	Ia +
Late Stage population		Ia +	Ia +
Antidepressants			
Established disease		IV +	IV +
Late Stage disease		IV +	IV +
Muscle relaxants			
Established disease		IV +	IV +
Late stage disease		IV +	IV +
DMARDS			
Early disease	III+(1,2,3)	III+	
Established disease	Ia+ (1,2,3)	I a +	I a +
Late stage disease	II+ (1,2,3)	II +	II
Biologicals			
Early disease	III+	III+	III+
Established disease	Ia+(1,2,3)	I a +	I b +
Late Stage disease	IV+	IV+	IV+
Glucocorticosteroids			
Early disease	III+		
Established disease	IIa (1,2)	I b +	I b +
Late stage disease	IV (1,2)	I b +	I b +
Minerals			
Established disease	IE		
Fish oils			
Established disease		II b +	
Vitamins C & D			
Established disease	IE		

Key: 1= X-ray score, 2= BMD, 3= MRI

Ia – IV grading of evidence	Nature of effect: + positive; 0 evidence of no effect; - negative effect
# inconsistent findings	IE inadequate evidence

Effect on Key Outcomes

The use of simple analgesics (Level Ia) and non-steroidal anti-inflammatory drugs can reduce pain (Level Ia). This improves function.

The early use of DMARD treatment can reduce pain and stiffness and prevent joint erosions, as defined by radiological changes (Level III). This improves the longterm outcome of the disease assessed by joint damage, pain and disability.

The later and continuous use of DMARDs, singly or in combination, will maintain disease suppression, reduce pain (Level Ia), prevent joint erosions (Level Ia) and improve or maintain function (Level Ib).

In non-responding patients and those who do not tolerate DMARDS, the use of biologicals may be considered (Level Ia-b).

Glucocorticosteroids will suppress the symptoms of rheumatoid arthritis (Level Ib), improve function (Level Ib) and probably prevent joint damage (Level IIa–IV).

The use of fish oil supplements in adequate doses can result in a reduction in tender joints and in morning stiffness (Level IIb).

Recommendations : Pharmacological Interventions

Rheumatoid arthritis has no known prevention. However, it is often possible to prevent damage of the joints with appropriate early treatment. Recent studies have shown that early, aggressive treatment for rheumatoid arthritis can delay the onset of joint destruction.

For the at risk population, that is those with early inflammatory arthritis, there is evidence that early diagnosis and treatment (early start with DMARDS, systemic or intra-articular corticosteroids) prevent the full occurrence of rheumatoid arthritis (C).

To reduce the impact of rheumatoid arthritis for those with the condition there is evidence to recommend the following for the reduction of pain, prevention of radiological progression and maintenance and restoration of function:

To reduce pain there is evidence to support the use simple analgesics (A), fish oils (B), NSAIDs (A), glucocorticosteroids (A) and DMARDS (A).

To prevent radiological progression there is evidence that DMARDS (A), biologicals (A) and glucocorticosteroids (A) are effective. Early use will improve outcomes.

To maintain and restoring function there is evidence for the use of analgesics (A), NSAIDs (A), glucocorticosteroids (A), and DMARDS (A).

Surgical Interventions

Rationale

The biomechanics of a rheumatoid arthritis joint can be improved by surgical modification. The replacement of joints is now possible for all those joints that are commonly affected by rheumatoid arthritis.

Surgery is indicated for severely affected joints. The most successful surgeries are those on the knees, hips, hands and feet. Usually, the first surgical treatment is removal of the synovium (synovectomy). Tendon repair is sometimes indicated. In advanced disease a total joint replacement with an arthroplasty can provide pain-free mobility of the joint.

Surgery can be expected to relieve joint pain, correct deformities and improve joint function. In advanced cases, total knee or hip replacement can mean the difference between being totally dependent on others or having an independent life at home.

Evidence

Table 3.5.4 summarises the level of evidence from selected and appraised guidelines, systematic reviews and major clinical studies for surgical interventions on the target outcomes (see list on pages 107-109). For many reasons it is difficult to assess the results of surgery in RA, particularly since the results is influenced how effectively the disease is controlled by anti-inflammatory drugs at the same time when surgery is performed. For the reasons data on longterm follow-up after surgery is limited, as it is difficult to distinguish the effect from other concurrent treatments (e.g. pharmacologicals).

Table 3.5.4

Surgical Interventions	Aims of Intervention		Activity & Participation HAQ
	Function / Structure		
	Tissue damage X-Ray Score	Symptom pain	
Arthroplasty			
Established disease		III+	III+
Late Stage disease		III+	III+
Osteotomy			
Established disease	III-	III+	IE
Late Stage disease	III-	III+	IE
Synovectomy			
Established disease		III+	IE
Late Stage disease		III+	IE
Tendon Repair	IE	IE	IE
Arthrodesis	III-	III-	IE

Ia – IV grading of evidence	Nature of effect:	+ positive;	0 evidence of no effect;	- negative effect
# inconsistent findings	IE inadequate evidence			

Effect on Key Outcomes

Surgery can be expected to relieve some aspects of joint pain (Level III)

Joint replacement with a joint prosthesis can improve and / or maintain function (Level III).

Recommendations : Surgical Interventions

To reduce the impact of rheumatoid arthritis there is evidence to recommend

- arthroplasty (C), osteotomy (C), synovectomy (C), and arthrodesis (C) which have a positive impact of pain reduction for patients with rheumatoid arthritis.
- arthroplasty (C) which has a positive effect on maintaining and restoring function.

Rehabilitative Interventions

Rationale

Rheumatoid arthritis is commonly associated with limited function that can be improved with a wide variety of rehabilitative interventions aimed at the whole person and not just at the painful area. These are part of the multi-disciplinary approach to the management of the person with rheumatoid arthritis.

Evidence

Table 3.5.5 summarises the level of evidence from selected and appraised guidelines, systematic reviews and major clinical studies for rehabilitative interventions on the target outcomes (see list on pages 107-109).

Table 3.5.5

Rehabilitation Interventions	Aims of Intervention		Activity & Participation
	Function / Structure		
	Tissue damage	Symptom	
Joint mobilisation			
Established disease		III+	IE
Late Stage disease		III+	IE
Joint specific exercises			
Established disease		IIB+	Ib+
Late Stage disease		IIB+	Ib+
Dynamic exercise			
Established disease		Ib+	IIB+
Late Stage disease		Ib+	IIB+
Joint protection			
Established disease		III+	II+
Braces, aids and devices			
Established disease		Ib+	IE
Late Stage disease		Ib+	IE
Support services, social interventions			
Established disease			IV+
Late Stage disease			IV+
Education & self management (short term effect)			
Established disease		IIa+	IIa+
Late Stage disease		IIa+	IIa+

Ia – IV grading of evidence	Nature of effect: + positive; 0 evidence of no effect; - negative effect
# inconsistent findings	IE inadequate evidence

Effect on Key Outcomes

Joint mobilisation and joint specific exercises can be of benefit in improving and maintaining function (Level III).

Dynamic exercise therapy (aerobic exercise) appears to be effective in improving physical capacity (aerobic capacity, muscle strength and joint mobility) (Level IIB) and maintaining function. Training in warm water may have the additional benefits for the patient to achieve the required training levels (increasing aerobic and muscle capacity) as well as positive effect on the cardiovascular function in a comfortable aquatic environment (Level IIB). Dynamic exercise therapy is more effective in increasing muscle strength and joint mobility than range of motion (ROM) and isometric exercises (Level IIB). Studies to evaluate the longterm effect of dynamic training in respect to functional ability are few but seem promising (Level IIB). Based on small patient numbers, dynamic exercise therapy does not increase pain (Level Ib). It does not appear to exacerbate disease activity or alter radiological progression, but there is currently insufficient evidence to draw a firm conclusion. An increase in aerobic capacity (Level Ib) should be an advantage in the preventing of cardiovascular risk in RA. However, research on the effect of dynamic exercise therapy on radiological progression as well as the reduction of cardiovascular morbidity is needed.

The effect of braces, aids or devices may have a preventive effect on pain secondary to an improved physical function (Level IV). Randomised control trials to focus on this area are needed.

Psychological interventions can reduce pain in the short term, but at follow-up (averaging 8.5 months) no post-intervention effect on pain was seen, however coping with the disease was maintained (Level Ib).

Patient education for adults with rheumatoid arthritis had no effect on the dimension of pain, but a short-term effect on psychological status that disappeared at follow-up (Level IIa).

There might be a trend in the effect of patient's education and interventions especially in the early phase of the disease. (Level IIB).

Recommendations : Rehabilitative Interventions

In those with rheumatoid arthritis:

To reduce pain there is evidence that pain management programs are effective (short term) (A). There is also evidence to support the recommendations that using physical modalities, hydrotherapy and multi-disciplinary interventions can reduce pain (A).

To prevent radiological progression there is no evidence that rehabilitative interventions are effective.

To maintain or restore function there is evidence to support the recommendations of appropriate exercise regime (dynamic exercise therapy) which will improve physical capacity, muscle strength and joint mobility (C); ensuring that there is adequate ergonomics at home and at workplaces; access to self-management programs and support groups; to make use of braces aids and devices; and multi-disciplinary interventions (C).

Key Recommendations for Rheumatoid Arthritis

The current standard of care is to initiate aggressive therapy with disease-modifying anti-rheumatic drugs (DMARDs) once the diagnosis is confirmed. This is in addition to rest, strengthening exercises, and anti-inflammatory agents.

	Recommendation
Whole population	To prevent rheumatoid arthritis and reduce its impact it is recommended that people stop smoking, undertake physical activity to increase and maintain fitness, and increase their knowledge through educational programmes to raise awareness and responsibility of their own body function
At risk	Those with early inflammatory arthritis should receive expert assessment and if developing rheumatoid arthritis, they should be treated as recommended.
Early and established RA	<p>Once diagnosed as rheumatoid arthritis, early treatment with disease-modifying anti-rheumatic drugs (DMARDs) is recommended. This is in addition to symptomatic therapy with anti-inflammatory analgesics and rehabilitative interventions with rest, strengthening and dynamic exercises, and patient education. Self management programs and support groups play an important role.</p> <p>If possible maintain participation in the family and in the workplace. Ergonomics at home and in the workplace may be required. Braces, aids and devices may be needed.</p> <p>The goal of treatment is to reach optimal control of rheumatoid inflammation or even remission along with minimising functional impairment, limitation of activities and restriction of participation. This requires an integrated multi-disciplinary and multi-professional team approach and the person and their treatment should be expertly monitored to ensure ideal management.</p> <p>Rheumatoid inflammation should be controlled as soon as possible, as completely as possible, and that control should be maintained for as long as possible, consistent with patient safety. In most cases this will mean that patients are treated with a DMARD or “biologic” agent. DMARDs should be used in high doses, capable to reduce inflammation, unless full treatment effect is gained at lower dosage or limiting toxicity is reached. When adequate control is not achieved, the DMARD should be changed or another DMARD or “biologic” agent added.</p> <p>Surgery can improve the biomechanics of joints, repair soft tissues, remove inflamed synovium, and replace or fuse severely damaged joints.</p>

Sources of data used to support recommendations

Guidelines

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3.6 Back pain (low back pain/non-specific back pain)

Key Definitions

Populations

Most of the population is at risk of back pain which has a lifetime prevalence of 60-85%. At any time about 15% of adults have back pain. Most cases are non-specific, but in 5-10% of cases a specific cause is identified. Red flags need to be recognised for when a specific cause is more likely. The important specific causes are symptoms of disc herniation, tumour, infection, inflammatory disease and osteoporotic fracture. There are also yellow flags for when non-specific back pain is more likely to be persistent or recurrent (see Table 2.3, Section 2.2 Risk Factors page 72).

The populations that have been used to assess the evidence and form a basis of the recommendations and strategies are therefore defined as:

Normal:	The whole population at all ages
At risk:	The general population at risk. Almost everyone has episodes of "back pain" but chronic back pain is different and is linked with various risk factors.
Early disease:	The population that has non-specific low back pain, acute or subacute non-specific back pain. Also included is back pain that lasts less than twelve weeks but with frequent recurrences. This is termed acute back pain.
Late disease:	The population that has chronic back pain with high disability that lasts for more than twelve weeks. This is termed chronic back pain.

Red flags are (6)

- Presentation under 20 years or onset over 55 years
- Violent trauma
- Constant, progressive, non-mechanical pain
- Thoracic pain
- Past history of cancer
- Systemic steroids
- Drug abuse, HIV
- Systemically unwell
- Weight loss
- Persisting severe restriction of lumbar flexion
- Widespread neurological signs and symptoms
- History of malignant tumour
- Structural deformity

Outcome measures against which to assess the evidence

In order to assess the evidence and develop recommendations key outcome measures were defined. These were:

For symptoms:	Pain
For tissue damage:	The definition of non-specific back pain excludes the presence of tissue damage of relevance to the problem
Activity / Participation:	Specific instruments to back pain: Roland Morris, Oswestry, Generic instruments: SF36, NHP, EuroQol Return to work

Targets for interventions

Targets that are most important in the prevention or management of back pain are:

- Reduction of pain
- Prevention of disability
- Maintaining work capacity

Interventions

The evidence for different interventions is considered in the context of the agreed targets for the prevention and treatment of back pain and for the populations that the evidence applies to. It is presented in Tables 3.6.1, 3.6.2, 3.6.3, and 3.6.4. The evidence for these recommendations is from selected and appraised guidelines, systematic reviews and major clinical studies (see list on pages 118-119).

Lifestyle Interventions

Rationale

Various lifestyle factors increase the risk of developing non-specific low back pain, increase the pain, and influence functional limitations associated with it. However, the independent prognostic value of these risk factors is usually low. Similarly, a number of factors have now been identified that may increase the risk of chronicity and longterm disability but not one single factor seems to have a strong impact.

Table 3.6.1 Risk factors for occurrence and chronicity of non-specific low back pain (7)

Risk Factors for Occurrence and Chronicity of Low Back Pain		
	Occurrence	Chronicity
Individual factors	Age	Obesity
	Physical fitness	Low educational level
	Strength of back and abdominal muscles	High levels of pain and disability
	Smoking	
Psychosocial factors	Stress	Distress
	Anxiety	Depressive mood
	Mood/emotions	Somatisation
	Cognitive functioning	
	Pain behaviour	
Occupational factors	Manual handling of materials	Job dissatisfaction
	Bending and twisting	Unavailability of light duty on return to work
	Whole-body vibration	Job requirement of lifting for $\frac{3}{4}$ of the day
	Job dissatisfaction	
	Monotonous tasks	
	Work relations/social support	
	Control	

Evidence

Table 3.6.2 summarises the level of evidence from selected and appraised guidelines, systematic reviews and major clinical studies for lifestyle interventions on the target outcomes (see list on pages 118-119).

Table 3.6.2

Lifestyle Interventions	Aims of Intervention		Activity & Participation
	Function / Structure		
	Tissue damage	Symptom	
Fitness Programmes			
At Risk population		Ia +	Ia +
Acute		Ia +	Ia +
Chronic		Ia +	Ia +
Education programmes (interactive)			
At Risk population		IE	IE
Acute		IE	IE
Chronic		II+ -III	Ia +
Advise to stay active (directive)			
At Risk population			
Acute		Ia +	Ia +

Ia – IV grading of evidence	Nature of effect:	+ positive;	0 evidence of no effect;	- negative effect
# inconsistent findings	IE	inadequate evidence		

Fitness programmes comprise of exercises for flexibility, aerobics, co-ordination, muscular strength and endurance. Usually they are performed on a daily basis during at least 30 minutes. Examples are endurance training like running, swimming, cycling or aerobic training.

Education programmes are aimed at explanatory downgrading to relieve fear. To be effective education programmes need to address patient worries and involve simple measures to enhance physical activity and ergonomic advice. Compliance is crucial for obtaining positive outcomes, but the evidence is unclear as to whether personal advice from a health professional is more effective than advice in the form of a pamphlet.

Effect on Key Outcomes

Fitness programmes, education programs and advice to stay active can prevent chronification of back pain (Level Ia).

Fitness programmes and advice to stay active can reduce pain (Level Ia).

Fitness programs, education programs and advice to stay active can improve / maintain function (Level Ia).

Recommendations : Lifestyle Interventions

To prevent non-specific low back pain for the whole population there is evidence to support the recommendation of physical activity (D).

To prevent non-specific low back pain for the at risk population there is evidence to support the recommendation of physical activity (A).

To reduce the impact of non-specific low back pain for those with the condition there is evidence to recommend physical activity (A) and education programs (A) which have a positive impact on maintaining and restoring activity and participation.

For all population definitions the recommended lifestyle interventions for low back pain is to stay physically active as far as possible (A).and to undertake moderate exercises several times per week.

Pharmacological Interventions

Rationale

Non-specific low back pain is characterised by pain, muscle tension or stiffness. These result in functional limitations. Drug therapies can control pain and may reduce muscle tension.

Evidence

Table 3.6.3 summarises the level of evidence from selected and appraised guidelines, systematic reviews and major clinical studies for pharmacological interventions on the target outcomes (see list on pages 118-119).

Table 3.6.3

Pharmacological Interventions	Aims of Intervention		Activity & Participation
	Function / Structure		
	Tissue damage	Symptom Pain	
Simple analgesics			
Acute		Ia +	Ia +
Chronic		Ia +	Ia +
Anti-inflammatory analgesics			
Acute		Ia +	Ia +
Chronic		Ia +	Ia +
Antidepressants			
Chronic		Ia +	
Muscle relaxants (1)			
Acute		Ia +	Ia +
Local treatment of epidural steroids			
Acute		Ia 0	Ia 0
Chronic		Ia 0	Ia 0

(1) muscle relaxants form the same substance group as diazepam (Valium) and as such share the same side effects such as drowsiness.

Ia – IV grading of evidence	Nature of effect:	+ positive;	0 evidence of no effect;	- negative effect
# inconsistent findings	IE inadequate evidence			

Pain can be relieved by the use of simple analgesics such as paracetamol or anti-inflammatory analgesics. Antidepressants, such as amitriptyline, also have a proven role in pain management for those with chronic back pain. Muscle relaxants such as tetrazepam can have a role in the management of back pain. Epidural injections of steroids are performed for back pain but evidence does not support their recommendation for acute or chronic non-specific back pain.

Effect on Key Outcomes

Pharmacological treatment does not have any effect on prevention of non-specific back pain or on prevention of chronification. Pharmacological treatment can reduce symptoms and improve function.

Simple analgesics, NSAIDs and muscle relaxants can reduce pain caused by non-specific back pain (Level Ia).

Simple analgesics, NSAIDs and muscle relaxants can improve and maintain function (Level Ia).

Recommendations : Pharmacological Interventions

To reduce the impact of non-specific low back pain for those with the condition there is evidence to support the use of simple analgesics (A), NSAIDs (A) and muscle relaxants (A) for pain reduction.

To reduce the impact of non-specific low back pain for those with the condition there is evidence to support the use of simple analgesics (A), NSAIDs (A) and muscle relaxants (A) to maintain and restore function.

Surgical Interventions

There is insufficient evidence of effectiveness for surgical interventions for non-specific low back pain to make recommendations as the longterm effects are unclear.

The term “specific low back pain” is restricted by some health care professionals to destructive diseases like tumour and infection, and to diseases associated with a neurologic deficit such as disc herniation and spinal stenosis. Others use this term in the presence of a localised source of pain when a specific structure of the spine is painful and if a specific diagnosis is available to characterise the cause of the pain. A beneficial effect of spinal fusion is assumed to depend on the determination of the exact level of pain. Two-year-follow-up results of spinal fusion in painful adult spondylolisthesis and in painful severe degeneration of the disc have been found to be better than the controls (unspecified conservative therapy). Some MRI findings were shown to occur more frequently in individuals with low back pain than in those without any history of back pain (Modic II changes and HIZ (hyperintensity zone) in the disc). Based on these findings many health care professionals believe that treatment must include specific measures if such specific causes are identified. There is, however, not enough evidence to establish recommendations which individual with low back pain must be investigated by MRI scan in order to recommend a more specific therapy. It is the policy of this report to leave this question open, and to give recommendations for the majority of patients in whom no localised and proven source of low back pain was identified.

Rehabilitative Interventions

Rationale

Non specific low back pain is commonly associated with limited function that can be improved with a wide variety of rehabilitative interventions aimed at the whole person and not just at the painful area. Interventions will be often used as part of a multimodel programme but the evidence presented relates to their effect as single interventions.

In the presence of a localised source of pain, if a specific structure of the spine is painful and if a specific diagnosis is available to characterise the cause of pain, some rehabilitative interventions are of proven efficacy. However, there is not enough evidence to establish recommendations for which individual with low back pain must be investigated by a therapist familiar with such techniques in order to recommend a more specific (=localised) therapy. It is the policy of this report to leave this question open, and to give recommendations for the majority of patients in whom no localised and proven source of low back pain was identified.

Evidence

Table 3.6.4 summarises the level of evidence from selected and appraised guidelines, systematic reviews and major clinical studies for rehabilitative interventions on the target outcomes (see list on pages 118-119).

Table 3.6.4

Rehabilitation Interventions	Aims of Intervention		
	Function / Structure		Activity & Participation
	Tissue damage	Symptom	
Angular joint mobilisation			
Acute		Ia; #	Ia; #
Joint play techniques			
Acute		Ia; +	Ia; +
Traction			
Acute		Ia; 0	Ia; 0
Chronic		Ia; 0	Ia; 0
Rest			
Acute		Ia -	Ia -
Chronic		Ia -	Ia -
Functional immobilisation			
At risk		Ia 0	Ia 0
Acute		Ia 0	Ia 0
Chronic		IE	IE
Strengthening exercises			
Acute		Ia 0	Ia 0
Chronic		Ia +	Ia 0
Flexibility techniques			
Acute		Ia 0	Ia 0
Chronic		Ia 0	Ia 0
Biofeedback			
Chronic		Ia 0	Ia 0
Relaxation Techniques			
Chronic		Ia +	Ia 0
Acupuncture			
Acute		Ia 0	Ia 0
Chronic		Ia 0	Ia 0
Aerobic fitness and endurance			
Chronic		Ia +	Ia +
Therapeutic cold			
Acute		IIa +	
Hydrotherapy			
Chronic		IIa +	IE
Massage			
Chronic		Ia +	Ia +
TENS			
Chronic		Ia 0	Ia 0
Behavioural treatment			
Acute		IE	IE
Chronic		Ia +	Ia +
Multi-disciplinary programs			
Chronic		Ia +	Ia +

Ia – IV grading of evidence	Nature of effect: + positive; 0 evidence of no effect; - negative effect
# inconsistent findings	IE inadequate evidence

Description of interventions

Angular joint mobilization

Active rom exercise – active training aiming at increased joint range of motion

Assisted rom-exercise – movements are guided in specific directions depending on the symptoms of the patient, e.g. Mckenzie-exercises

Passive rom-exercise – comprise stretching of muscle and connective tissue structures while the muscle is relaxed.

Joint play techniques

Mobilisation (gliding of joint surfaces) – manipulation or slower mobilizing techniques, provided by a therapist specialized in manual therapy (chiropractor, osteopath, naprapath, physiotherapist, physician) by the use of a precise, directed force or thrust aiming to increase mobility between specified vertebrae and their muscles.

Traction – the spine is pulled in a longitudinal direction, sometimes with a component of lateral rotation, aiming to increase nerve root space and mobility.

Joint immobilization

Rest – comprise bed rest and advise to “rest and be careful”

Functional immobilisation / corsets / braces / lumbar supports – can be of material with different stiffness, and serve as reminder not to perform excessive movements.

Muscle techniques

Strengthening exercises –aiming to increase muscle performance such as muscle activation, endurance and strength. Usually back, thigh and abdominal muscles is the target.

Flexibility training / stretching – aiming to decrease joint and muscle stiffness. To be effective the exercises need to be conducted at least once a day.

Neuromuscular rehabilitation

Biofeedback – is used as electrical impulses to the muscles in order to stimulate endorphin production and reduce pain (tens, see below), or as a tool to achieve appropriate muscle activation during muscle techniques training. The latter biofeedback can also be given by verbal or visual stimuli.

Progressive relaxation techniques – training to decrease tense muscle activity through practicing more, and more complex situations, e.g. From lying supine in a silent environment to applying the techniques in situations where the muscles usually get tense and painful.

Acupuncture – very thin needles are applied for 25-30 minutes at a defined depth in specific acupunctures points in order to give impulses to stimulate endorphin production and reduce pain. Sometimes electrical impulses are applied through the needles in order to increase the effect.

Physical fitness

Aerobic fitness and endurance – exercises aiming to improve lung function and muscle performance, such as ergometer-cycling. Pulse rate should exceed 120 beats/minute for three minutes during intervals.

Physical modalities

Therapeutic cold – decreases nerve conduction velocity. Is applied locally for 10-15 minutes.

Hydrotherapy – involve both locally applied heat and exercises in warm water.

Massage – involve general massage techniques and locally applied techniques over tender points (acupressure) or muscles.

Tens – transcutan electrical nerve stimulation. Electrical impulses are applied through rubber plates on the skin over nerves and muscles using an apparatus where current and frequency can be adjusted. Can be used for 20-30 minutes daily in order to stimulate endorphin production and reduce pain.

Behavioural treatment

Focus is on cognitive behaviour and can be provided for each individually with content to suite the demands of the patient or for groups. Exercises and planned activities are used as means to achieve changes in health promoting habits and behaviour.

Multidisciplinary treatment programs

A comprehensive, multi-professional program with a combination of treatments, education, strengthening exercises, and aerobic and fitness training. Usually the program is conducted during full or half days for at least four weeks, sometimes combined with work-related measures and/or cognitive behavioural treatment.

Effect on Key Outcomes

Maintaining physical activity, avoiding rest and manual therapy can reduce pain and maintain and restore function in acute back pain (Level Ia)

Behavioural treatment can prevent chronification of back pain (Level Ia).

Aerobic fitness and endurance training, behavioural treatment and multi-disciplinary treatment programs can reduce pain in chronic back pain (Level Ia).

Aerobic fitness and endurance training, behavioural treatment and multi-disciplinary treatment programs can improve / maintain function in chronic back pain (Level Ia).

Recommendations : Rehabilitative Interventions

To reduce the impact of acute non specific low back pain for those with the condition by reducing pain and maintaining and restoring function, avoiding rest, maintaining physical activity and manual therapy is recommended (A)

To reduce the impact of chronic non specific low back pain for those with the condition by reducing pain and by maintaining and restoring function there is evidence to support the role of aerobic fitness and endurance training (A) behavioural treatment (A) and multi-disciplinary treatment programs (A).

Key Recommendations for Non Specific Low Back Pain

Population	Recommendation
Normal and At Risk	Stay physically active and do moderate exercises several times a week. Address risk factors
Early Stage: Until 6 weeks After 6 weeks From 6-12 weeks	If you feel some back pain, this is normal. Stay active and avoid bed rest. Reduce pain by medication (paracetamol at first, then if it is not effective NSAIDs) or manual therapy. Be aware of red and yellow flags, and investigate as appropriate Thorough assessment. Look for red flags to exclude tumour, infection, rheumatoid disease, fracture, and disorders with neurologic deficit. Identify yellow flags It is not routinely recommended to undertake imaging unless suspicious of red flags. Undertake behavioural therapy including reassurance, training and workplace contact. Attempt to get the person back to work.
Late Stage Thorough investigation after 3 months At greater than 3 months	Start to address rehabilitation programs Undertake multi-professional rehabilitation programs including workplace contacts and occupational training.

Sources of data used to support recommendations

Guidelines

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3.7 Osteoporosis

Key Definitions

Populations

Osteoporosis, defined as a reduced bone density (T score at the spine and/or hip of -2.5 or lower), affects about 20% of women 60 - 69 years. The clinical manifestation of osteoporosis is a fracture following low energy trauma. The lifetime risk of sustaining a low energy (fragility) fracture after the age of 60 years is 45%. The prevalence of osteoporosis and risk of fracture increases with age. There are other risk factors for low bone mass and fracture (Table 2.5 page 73). The early stage of the condition can be considered as when there is low bone mass but no fracture has been sustained. This is called osteoporosis. The later stage is when a low trauma fracture has occurred. This is called established osteoporosis.

The populations that have been used to assess the evidence and form a basis of the recommendations and strategies are therefore defined as:

Normal:	the whole population at all ages
At risk:	older people (>65 years) men and women with strong risk factors (e.g. untreated hypogonadism, previous low energy fracture, glucocorticoid therapy, BMI <19 kg/m ² , maternal history of hip fracture, excess alcohol intake, smoking)
Osteoporosis:	men and women with a BMD T score at the spine and/or hip of -2.5 or lower
Established Osteoporosis:	men and women with one or more fragility fracture \pm BMD T score below -2.5

Outcome measures against which to assess the evidence

In order to assess the evidence and develop recommendations key outcome measures have been defined. These are:

For symptoms:	Pain
For tissue damage:	Fracture
	Bone density
Activity / Participation:	Disease specific instruments: EFFOQOL, OPAQ Generic instruments: SF36, NHP, EuroQol

Targets for intervention

Targets that are most important in the prevention or management of osteoporosis and low trauma fractures are to:

- Maximise bone mass
 - maximise peak bone mass
 - reduce age-related bone loss
- Prevent falls
- Avoid other risk factors for osteoporosis and fracture
- Reduce pain
- Reduce disability

Interventions

The evidence for different interventions is considered in the context of the agreed targets for the prevention and treatment of osteoporosis and for the populations that the evidence applies to. It is presented in Tables 3.7.1, 3.7.2, 3.7.3, and 3.7.4. The evidence for these recommendations is from selected and appraised guidelines, systematic reviews and major clinical studies (see list on page 126).

Lifestyle Interventions

Rationale

Several lifestyle variables are associated with low bone mineral density and/or increased fracture risk. Most of these act through effects on bone mineral density which is an important predictor of fracture but some lifestyle variables, such as exercise and alcohol, also affect the risk of falling and the associated protective responses.

Raising public awareness of those who may be at risk of osteoporosis or of falling may lead to the early identification and appropriate management of those at increased risk of fracture.

Avoiding or reversing some of these lifestyle variables may prevent osteoporosis and reduce fracture risk and the subsequent outcome of fracture.

Evidence

Table 3.7.1 summarises the level of evidence from selected and appraised guidelines, systematic reviews and major clinical studies for lifestyle interventions on the target outcomes (see list on page 126).

Table 3.7.1

Lifestyle Interventions	Aim of Intervention			Activity & Participation
	Function & Structure		Symptom	
	Tissue damage			
	BMD	Fracture		
Diet - calcium	Ia+	III+		
Weight - maintenance of a normal body mass index	III+	III+		
Exercise – weight bearing	Ia+	III+		
Avoiding smoking	III+	III+		
Avoiding alcohol abuse	IV+	IV+		

Ia – IV grading of evidence	Nature of effect: + positive; 0 evidence of no effect; - negative effect
# inconsistent findings	IE inadequate evidence

Effect on Key Outcomes

Dietary calcium has a beneficial effect on bone mineral density (Level Ia) and risk of hip fracture (Level III).

Weight bearing physical exercise has a beneficial effect on bone mineral density (Level Ia) and risk of hip fracture (Level III).

The avoidance of tobacco has a beneficial effect on bone mineral density and fracture risk (Level III).

The avoidance of alcohol excess has a beneficial effect on bone mineral density and fracture risk (Level IV).

Maintenance of a normal body mass index (BMI) has a beneficial effect on bone mineral density and fracture risk (Level III).

Recommendations : Lifestyle Interventions:

To increase peak bone mass and reduce age-related bone loss in the whole population there is evidence to support recommendation of an adequate dietary calcium intake (A), programmes to promote regular weight bearing exercises (A), the maintenance of adequate body weight (C).

To reduce age related bone loss in the whole population it is recommended that in addition to the above recommendations tobacco use and alcohol abuse are avoided. (C and D respectively).

All of the above recommendations may reduce fracture risk in the adult population (C and D).

Pharmacological Interventions

Rationale

The use of pharmacological interventions is effective in reducing pain following fractures, the prevention and reduction of bone loss and the reduction of the risk of fracture.

Analgesics (simple, compound, anti-inflammatory and opiate) are used to control acute and chronic pain associated with fractures. Pain management will reduce disability associated with fractures. Several pharmacological interventions reduce bone turnover mainly by reducing bone resorption. These anti-resorptive drugs, which include the bisphosphonates, raloxifene and oestrogen, inhibit the formation and activity of osteoclasts, thus reducing bone turnover, preventing bone loss and reducing the risk of fracture. Parathyroid hormone peptides and sodium fluoride have a different mechanism of action; they are anabolic agents and increase bone formation, thus resulting in greater increases in bone mineral density than those observed with antiresorptive agents.

Evidence

Table 3.7.2 summarises the level of evidence from selected and appraised guidelines, systematic reviews and major clinical studies for pharmacological interventions on the target outcomes (see list on page 126).

In general these agents have been most thoroughly evaluated in women with established osteoporosis.

Where present, fracture reduction has generally only been shown for postmenopausal women with established osteoporosis, although in a small number of studies fracture reduction has been demonstrated in at risk female populations or those with osteoporosis without fracture. For most interventions, beneficial effects on BMD have been shown in at risk female populations and in women with osteoporosis or established osteoporosis.

Table 3.7.2

Pharmacological Interventions	Aim of Intervention						
	Function & Structure				Symptom pain		Activity & Participation
	Tissue damage			BMD			
	Fracture						
Vert	Non Vert	Hip					
Analgesics						IV+	
Anti-inflammatories/Analgesics						IV+	
Calcitonin (short term)						Ib+ (vertebral fracture)	
HRT	Ia+	Ib+	Ib+	Ib+			Ib+
Raloxifene	Ib+	Ib+					Ib+
Tibolone	Ia+						Ib+
Calcium + Vitamin D	Ib+		Ib+ *	Ib+ *			
Vitamin D	Ib+		IIa+	III+#			
Calcitriol	Ib+	Ib+#	III+				
Etidronate	Ia+	Ia+	III+	III+			
Alendronate	Ia+	Ia+	Ia+	Ia+	Ib+		Ib+
Risedronate	Ia+	Ia+	Ia+#	Ib+			
Ibandronate	Ib+	Ib+					
Zoledronate	Ib+						
Calcitonin	Ia+	Ia+#	Ia+#	III+	Ib+		
Fluoride	Ia+	Ib+#	0	0			
PTH 1-34 peptide	Ib+	Ib+	Ib+				
1-alpha	Ib+	Ib+#					
Strontium ranelate	Ib+	Ib+	Ib+		Ib+		Ib+
Anabolic steroids	Ib+						
Progesterone cream	IE	IE	IE	IE	IE		IE
Soya supplements	Ib+						

* evidence applies to very elderly women living in sheltered accommodation, not the whole elderly population

Effect on Key Outcomes

Analgesics and non-steroidal anti-inflammatory drugs reduce pain associated with fracture (Level IV evidence).

Calcitonin reduces pain associated with acute vertebral fracture (Level Ib).

A number of pharmacological agents reduce or prevent menopausal and age-related bone loss, reduce fracture risk and improve activity and participation (see Table 3.7.2; levels of evidence Ia or Ib). Reduction in fracture risk has generally been demonstrated for postmenopausal women with established osteoporosis although some interventions have also been shown to be effective in postmenopausal women with osteoporosis.

Recommendations : Pharmacological Interventions

To reduce pain in patients with fractures it is recommended that analgesics (D) or non-steroidal anti-inflammatory drugs (D) should be used. Calcitonin may be used for pain associated with recent vertebral fracture (A).

To prevent osteoporotic fracture in the high risk population, osteoporosis or established osteoporosis, there is evidence to support the recommendation of alendronate (A), alfacalcidol (A), calcitonin (A), calcitriol (A), etidronate (A), HRT (A), PTH 1-34 peptide (A), raloxifene (A), risedronate (A), and tibolone (B). This list is restricted to those agents that are currently licensed for use in osteoporosis in Europe (June 2003). Licensing varies between different European countries. Anti-fracture efficacy has not been established at all sites for some agents.

To reduce hip fracture risk in the frail older population, such as elderly individuals living in sheltered accommodation or nursing homes, calcium and vitamin D supplementation is recommended (A).

Surgical Interventions

Surgical interventions for osteoporosis relate to the management of fractures. The principles of treatment are relief of pain and restoration of function, but there are important considerations in dealing with osteoporotic bone, and some of the standard techniques and implants used in younger adults may not be suitable for osteoporotic patients. In general, the aim is to avoid prolonged bed rest, and to provide support for lower limb fractures to allow early weight bearing. Where there are concerns about fracture healing, eg. displaced intracapsular hip fractures in elderly patients, it is common to treat the fracture by excising the femoral head and inserting an arthroplasty.

Appropriate management of a fracture includes immediate supportive measures for the patient and the fracture, with admission to hospital if required. Thereafter the patient should undergo definitive conservative or operative treatment of the fracture without undue delay, while recognising and managing any comorbid conditions.

There are insufficient data on techniques to restore the structure of vertebral bodies, such as vertebroplasty or kyphoplasty, to make any recommendations.

Rehabilitative and Other Non-pharmacological Interventions

Rationale

The majority of rehabilitative and non-pharmacological interventions are aimed at improving disease-related symptoms, mobility and reducing the risk of falls. Rehabilitation is usually by an integrated multi-disciplinary team. It follows adequate management of the fracture.

Fall prevention is the combination of an individual assessment for internal and external risk factors combined with interventions to reduce these risks. It also involves ensuring others (carers and health professionals) recognise those at risk of falling.

Hip protectors may be used to reduce the risk of hip fractures in frail older people living in residential care or nursing homes.

Evidence

Table 3.7.3 summarises the level of evidence from selected and appraised guidelines, systematic reviews and major clinical studies for rehabilitative interventions on the target outcomes (see list on page 126).

Table 3.7.3

Rehabilitative Intervention	Aim of Intervention			Activity & Participation
	Function & Structure		Symptom	
	Tissue damage			
	BMD	Fracture		
Physiotherapy				
Established Osteoporosis			IV+	IV+
Multi-disciplinary rehabilitation				
Established Osteoporosis			III+	III+
Education				
Normal population, at risk population, osteoporosis, established osteoporosis			IV+	IV+
Support groups				
Normal population, at risk population, osteoporosis, established osteoporosis			IV+	IV+
Nutritional support				
Established Osteoporosis		III+		Ia+
Falls prevention*				
At risk population, osteoporosis, established osteoporosis				Ia+
Hip protectors				
Established osteoporosis		Ia+ #		

Key: * = In individuals with high risk of falls

Ia – IV grading of evidence	Nature of effect: + positive; 0 evidence of no effect; - negative effect
# inconsistent findings	IE inadequate evidence

Effect on Key Outcomes

Physiotherapy (including exercise, hydrotherapy and TENS) may reduce pain associated with osteoporotic fracture and improve mobility and confidence (Level IV)

Multi-disciplinary rehabilitation after hip fracture has beneficial effects on recovery of independent mobility and function (Level III)

Nutritional support during hospitalisation for hip fracture has been shown to reduce post-operative complications and may reduce the number of days spent in hospital (Level Ia).

Interventions that target multiple risk factors can be effective in reducing falls in those at high risk of falling (Level Ia).

Home-based programmes aimed at improving strength and balance reduce the number of falls in women aged 80 year or more in community settings (Level Ia).

Hip protectors may reduce hip fracture risk in frail older people living in residential care or nursing homes (Level Ia).

The use of education and support groups has not been systematically investigated but these measures are likely to be valuable in promoting skeletal health at all ages (Level IV)

Recommendations : Rehabilitation and Non-Pharmacological Interventions

To provide symptomatic relief and improve mobility and confidence in patients with established osteoporosis physiotherapy is recommended (D).

To prevent falls in people at high risk of falling it is recommended that falls prevention programmes should be implemented (A).

To improve functional recovery after hip fracture, it is recommended that there should be a multi-disciplinary programme of rehabilitation after adequate management of the fracture (C).

To reduce complications after hip fracture operations and reduce length of stay, it is recommended that nutritional support should be given to patients (A).

To reduce hip fracture risk in the frail elderly living in residential care or nursing homes, the use of hip protectors is recommended (A).

To promote skeletal health in the whole populations, educational programmes are recommended (D).

To educate and support people with osteoporosis and their carers, support groups are recommended (D).

Key Recommendations for Osteoporosis

Population	Recommendation
Whole population	The whole population should keep physically active, maintain an ideal body weight, have adequate dietary calcium, avoid tobacco use and excess alcohol.
At risk population	For the at risk population education and lifestyle advice should be provided, together with the correction of calcium and vitamin D deficiency and risk factor modification where possible. Case-finding strategies should be implemented to identify individuals with a high fracture probability. Interventions should be initiated for those with a high fracture probability as outlined below.
Those with osteoporosis	For the population with osteoporosis (BMD T score < -2.5) there should be educational and lifestyle advice programmes. For those identified as having a high risk of fracture there should be appropriate pharmacological interventions. For older people at high risk of falling there should be in addition a falls prevention programme.
Those with established osteoporosis	For those with established osteoporosis there are a number of key strategies that depend on the severity and stage of the disease. The appropriate strategy will consist of one or a combination of the following: <ul style="list-style-type: none"> • Education • Lifestyle advice (as above) • Analgesia when indicated • Physiotherapy when indicated • Pharmacological intervention with bone active drugs • Falls prevention programme in older people at high risk of falling • Calcium and vitamin D supplementation in frail older people • Orthopaedic management of fracture when indicated • Multi-disciplinary rehabilitation • Nutritional support • Hip protectors for frail older people in residential care or nursing homes

Sources of data used to support recommendations

Guidelines

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Systematic Reviews and Supporting Material

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3.8 Musculoskeletal Injuries: Limb Trauma, Occupational Injuries and Sports Injuries

Introduction

There is a wide spectrum of trauma and injuries that affect the musculoskeletal system in terms of the cause, the structural damage and the outcome. For the purposes of this report, musculoskeletal trauma and injuries will be considered in the context of (a) major limb trauma, (b) occupational and (c) sports injuries. The nature of trauma differs from the other conditions considered by this report. This section therefore follows a slightly different format.

Key Definitions

Populations

The populations that have been used to assess the evidence and form a basis of the recommendations and strategies are defined as:

- Normal: Whole population at all ages
- At risk: Children (0-16), especially those in the playground and household environment
 - Youth (17-25), especially those involved in sports and are car or motorbike drivers
 - Population at working age (25-65), especially those involved in sports and high risk occupations
 - Older people (65 plus), especially those at risk of falls
 - In addition any individuals with identified risk factors within the above age bands
 - For sports consider differentiation between recreational, club, country, international and professional
- Early phase: Acute phase of injury – tissue healing / repair phase
- Late phase: Chronic symptoms with disability attributable to injury (WHO ICF)

Outcome measures against which to assess the evidence

In order to assess the evidence and develop recommendations key outcome measures were defined. These were:

- For symptoms: Pain and loss of function and psychological / vitality impact
- For tissue damage: Damage shown by clinical assessment (soft tissues) and imaging
- Activity / Participation Specific instruments for trauma: MFA
 - Generic instruments: SF36, NHP, EUROQOL

Targets for intervention

- To prevent injuries related trauma by
 - a) preventing trauma
 - b) minimising injury following trauma
- To restore structure
- To reduce pain and other symptoms
- To reduce short and long term disability

Interventions

The evidence for different interventions is considered in the context of the agreed targets for the prevention and treatment of musculoskeletal injuries and for the populations that the evidence applies to. These injuries range from major limb trauma to sprains and strains associated with occupation or sports. The evidence is presented in Tables 3.5.1, 3.5.2, 3.5.3, and 3.5.4. The evidence for these recommendations is from selected and appraised guidelines, systematic reviews and major clinical studies (see list on pages 137-141).

Lifestyle Interventions

Rationale

Various lifestyle factors may increase the risk of sustaining trauma and lead to an increase in the associated consequences of pain and functional limitations. The field of trauma is vast and it covers all ages and almost all activities. Therefore, the number of risk factors is great (a list of risk factors that are associated with both occurrence and outcome are in given in Part 2, Table 2.7).

Individual responsibility as well as legislation and common rules are needed to prevent and minimise injury.

Evidence

Table 3.8.1 summarises the level of evidence from selected and appraised guidelines, systematic reviews and major clinical studies for lifestyle interventions on the target outcomes (see list on pages 137-141).

Table 3.8.1

Lifestyle Interventions for those at risk	Aims of Intervention			
	Prevent Injuries	Minimise injury	Symptoms pain	Activity & Participation
Children				
Remove external risks	IIb +	IIb +		
Modification of home environment	Ia #	Ia #		
Use correct equipment	IIb +	IIb +		
Use protective equipment	Ia +	Ia +		
Educate to avoid risks	III +	III +		
Obey the rules	III +	III +		
Learn cycling, participating in traffic etc	IV +	IV +		
Learn swimming	IV +	IV +		
Pool fencing	III +	III +		
Nurse home visitation to prevent child abuse	Ib +	Ib +		
Identify children suffering from abuse	IE	III +		
Youth				
Remove external risks	Ia +	Ia +		
Encourage use of safety equipment	IIa +	IIa +		
Education & Training Programs	III +	III +		
Maintain adequate physical activity	III +	III +		
Drugs - education & avoidance	IE	IE		
Alcohol –laws against consumption or access	III +	III +		
Working Age				
Removing external risks	IIa +	IIa +		
Modification of home environment	Ia #	Ia #		
Identify risks associated with occupation	IV +	IV +		
Safety equipment for sports, occupations, cars, etc.	IV +	IV +		
Post-license driver education	Ia 0	Ia 0		

Maintain adequate physical activity	III +	III +		
Drugs - education & avoidance	III +	III +		
Alcohol –laws against consumption or access	III +	III +		
Early identification of domestic violence	IV +	IV +		
Older				
Removing external risks	Ia 0	Ia 0		
Modification of home environment	Ia #	Ia #		
Safety equipment	Ia +	Ia +		
Maintain adequate physical activity	Ib +	Ib +		
Falls prevention program	Ia +	Ia +		
Brisk walking	Ib -	Ib -		
Hip protector	Ia #	Ia #		
Early identification of domestic violence	IV +	IV +		

Ia – IV grading of evidence	Nature of effect:	+ positive;	0 evidence of no effect;	- negative effect
# inconsistent findings	IE inadequate evidence			

Effect on Key Outcomes

Injuries and their consequences can be prevented by either preventing trauma or minimising injury following trauma.

Trauma can be prevented by education to avoid risks and by removal of external risk.

Avoidance includes education and training programs, obeying the rules and regulations, maintaining adequate physical fitness, using adequate and safe equipment and avoiding drugs and alcohol.

Removal of external risks includes modification of home and work place environment, safe roads, sporting facilities and playgrounds, enforcement of rules and regulations and early identification of domestic violence.

Injuries following trauma can be minimised by using protective equipment, by training avoidance programs, as well as maintaining adequate physical fitness and bone mass.

Recommendations : Lifestyle Interventions

To prevent injuries in childhood there is evidence to recommend modification of home environment in regard to removal of external risks (e.g. pool fencing, safety sockets, coverage of staircase and kitchen appliance). Safe toys and appropriate safety measurements on bicycles might prevent injuries. Early education of swimming can reduce the risk of drowning. Early education on traffic can reduce the risk of involvement in a traffic accident. Obeying the rules while participating in sports activities might protect the opponent and prevent self-inflicted injuries.

To minimise the injury following trauma in childhood there is evidence for the use of protective equipment (child safety seats or booster seat, helmets, life jackets, flotation device). Early identification of children suffering from abuse might allow professionals to intervene in an early stage.

To prevent injuries in the youth, the recommendations are focussed especially on those involved in sports and driving cars and motorbikes. Special education and training programs as well as obeying the rules seem to reduce the number of sports injuries, occupational and traffic injuries. Establishment and reinforcement of legal actions against access and consumption of alcohol and other drugs will reduce the number of injuries. Speed control and avoidance of reckless behaviour is crucial for lowering the number of traffic accidents.

To minimise the injury following trauma in the youth encouragement of the use of protective equipment in sports and traffics (helmets, seat belts etc.) is helpful. Fast and adequate first treatment is crucial for the extent and the longterm prognosis of the injury.

To prevent injuries in the working age identification of risk factors associated with occupation is crucial. Avoid physically repetitive work. Appropriate safety equipment and adaptation of work and home environment can reduce the number of accidents. Risk in traffic and in sports needs to be addressed as described before. In this age it is especially important to maintain adequate physical activity. This will increase bone mass. Obeying rules and regulations prevents the risk for self-inflicted injuries and damage to others. Avoidance of alcohol and other drugs as well as appropriate participation in traffic or occupation when taking medication is advisable.

To minimise the injury following trauma in the working age the use of protective equipment is recommended in occupation, traffic and sports. Adequate early treatment is essential for the further progress of the injury.

To prevent injuries in the older population especially multi-modal fall prevention programs might reduce the risk of falls. Together with adequate physical activity and bone mass and removing of external risk factors at home these intervention will reduce the risk for fractures. Appropriate control and treatment of cardiovascular and neurological diseases as well as visual impairment will allow active participation at home and in public incl. traffic. Avoidance of excessive alcohol and medications can limit the risk for accidents

To minimise the injury following trauma in the older population protective equipment, including hip protectors have shown to reduce the fracture risk in high-risk subgroups. Early detection of domestic violence might allow for appropriate intervention.

Pharmacological Interventions

Rationale

Pharmacological interventions in trauma are mainly used for pain control, and treatment of inflammation. In addition prophylaxis against DVT and infection should prevent further complications

Evidence

Table 3.8.2 summarises the level of evidence from selected and appraised guidelines, systematic reviews and major clinical studies for pharmacological interventions on the target outcomes (see list on pages 137-141).

Table 3.8.2

Pharmacological Interventions	Aims of Intervention		Activity & Participation
	Function / Structure		
	Tissue damage	Symptom pain	
Symptom			
Analgesics		Ia+	Ia+
NSAIDs		Ia+	Ia+
Prevention of complications			
Antithrombotics	Ia+	Ia+	IV+
Antibiotics	Ia+	Ia+	IV+
NSAIDs	Ia+	Ia+	IV+
Disease process			
BMPs	Ib+	Ib+	Ib+
Local treatments			
Topical NSAIDs etc		Ib+	III
Steroid injections	# +/-	Ib+	III
Fibrin Spray	IIa+	III	III
Skin substitutes	IIa+	III	III
Supplements			
Calcium and vit D	Ib #		III #
Glucosamine	Ib #	Ib #	III #

Ia – IV grading of evidence	Nature of effect: + positive; 0 evidence of no effect; - negative effect
# inconsistent findings	IE inadequate evidence

Effect on Key Outcomes

There is no evidence that pharmacological interventions can prevent injuries.

Some agents can reduce the impact of trauma for those with the condition.

Tissue damage in osteoporosis (fragility fractures) can be prevented by pharmacological agents and dietary supplements (see page 122).

Tissue damage such as bone fracture and soft tissue injuries seems not to be affected by most of the pharmacological agents. However, RhBMP-2 might accelerate fracture and wound healing, reduce infection rate and reduce the frequency of secondary interventions in patients with an open fracture of the tibia. Skin substitutes can be used efficiently to fill wound gaps. NSAIDs seem to inhibit bone healing in some patients.

Analgesics and NSAIDs can reduce pain, where especially the latter have an additional anti-inflammatory effect. Steroid injections and topical NSAIDs might also have a local analgesic and anti-inflammatory effect.

There is evidence, that complications such as thrombosis (antithrombotics), infection (antibiotics) and heterotopic ossification (NSAIDs) can be prevented efficiently by pharmacological interventions.

There is evidence that dietary supplements such as Vitamin D and calcium are effective in preventing fracture in certain risk groups. There is no strong evidence that dietary supplements have any impact in patients with sports injuries or major trauma.

Recommendations : Pharmacological Interventions:

There are no recommendations for the use of pharmacological interventions as a *preventive measure* against trauma.

To avoid tissue damage in osteoporosis (fragility fractures) there are pharmacological agents recommended in certain patients with risk factors (see page 122).

To reduce the impact of pain caused by trauma there is evidence to support the use of analgesics, local and systemic NSAIDs and steroid injections.

To reduce trauma-related restriction in activity and participation due to complications like infection, thrombosis and heterotopic ossification, there is clear evidence that antibiotics can prevent post-injury infection, while antithrombotics can prevent thrombosis and pulmonary embolism and heterotopic bone formation is limited by NSAIDs.

To reduce trauma-related tissue damage the application of BMPs and skin substitutes might improve healing.

Surgical Interventions:

Rationale

Surgical interventions for trauma victims can be used to restore structure, reduce pain and reduce both short and longterm disability caused by trauma injuries from accidents, participation in sports or due to certain occupations.

Evidence

Table 3.8.3 summarises the level of evidence from selected and appraised guidelines, systematic reviews and major clinical studies for surgical interventions on the target outcomes (see list on pages 137-141).

Table 3.8.3

Surgical Interventions	Aims of Intervention		
	Function / Structure		Activity & Participation
	Tissue damage	Symptom pain	
Repair			
Reconstruction of the tendon, capsule, muscle and ligament	III+	III+	III+
Stabilisation of fractures	IIa / III+	IIa / III+	IIa / III+
Replantation of limbs	III+	III+	III+
Plastic surgery	III+	III+	III+
Remove			
Amputation		III+	III+
Foreign bodies	IV+	IV	IV
Arthroscopic surgery	IIa+	IIa+	IIa+
Replace			
Arthroplasty		III+	III+
Bone transplantation	III+	III+	III+
Skin transplantation	III+	III+	III+
Cartilage transplantation	III#	III#	III#

Ia – IV grading of evidence	Nature of effect:	+ positive;	0 evidence of no effect;	- negative effect
# inconsistent findings	IE inadequate evidence			

Effect on Key Outcomes

Reconstruction of soft tissue injury (e.g. cruciate ligaments, achilles tendon) restore structure and reduce long term disability (Level III).

Reduction and stabilisation of fractures restore structure, reduce pain and improves short and long term disability (Level IIa / III).

Reattachment of limbs (especially fingers) might sometimes improve activity and participation as well as long term disability (Level III).

Plastic surgery allows reconstruction of severely injured areas and to cover open defects by tissue transplantation, thereby reducing long term disability (Level III).

Amputation might allow in severely damaged tissue early rehabilitation and activity and participation (Level IIb/III)

Arthroscopic surgery as compared to open treatment can reduce short term disability (Level III) and allows to diminish tissue damage and pain by removing destroyed debris (Level III).

Prosthetic replacements of severely damaged joints reduce pain and disability and can facilitate early and appropriate activity and participation (Level III).

Bone and skin transplantation enhance healing of bone and soft tissue and reduces long term disability (Level III)

Autologous cartilage implantation for full thickness articular cartilage defects of the knee must currently be considered as a technology under investigation whose effectiveness is yet to be determined in well designed and conducted clinical trials.

Recommendations : Surgical Interventions

There are no recommendations for surgical interventions that *prevent trauma* in the whole population

To reduce the impact of trauma-related pain removal of debris, bone, cartilage or meniscal fragments as well as foreign bodies is recommended (C). There is clear evidence that reconstruction and stabilization of soft tissue injuries or bone fractures reduces pain (C). In advanced joint disease with pain there is clear evidence that arthroplasties, especially hip and knee replacements, will allow for serious reduction of pain (C).

To reduce the impact of trauma-related tissue damage there is evidence that repair of bone and soft tissue lesions by reconstruction of tendons and ligaments, capsules and bones is effective (B-C). Bone and skin transplantation as well as plastic surgery can rebuild former physical defects (C).

To reduce the impact of trauma-related impact on activity and participation there is clear evidence that reconstruction, repair or replacement with an arthroplasty can clearly improve the functional status (B-C)

Rehabilitative Interventions

Rationale

Trauma is commonly associated with limited function that can be improved with a wide variety of rehabilitate interventions aimed at the whole person and not just at the affected structure. The aims of rehabilitation are to manage pain, increase mobility and improve activity.

Evidence

Table 3.8.4 summarises the level of evidence from selected and appraised guidelines, systematic reviews and major clinical studies for rehabilitative interventions on the target outcomes (see list on pages 137-141).

Table 3.8.4

Rehabilitation Interventions	Aims of Intervention		Activity & Participation
	Function / Structure		
	Tissue damage	Symptom pain	
PRICE (Protection, Rest, Ice, Compression, Elevation)	Ib +	Ib +	Ib +
Joint mobilisation		Ib +	Ib +
Joint specific exercises		Ib +	Ib +
Joint immobilisation	Ib	Ib +	
Physical fitness	III +	III +	III +
Braces, aids and devices	Ib +	Ib +	Ib +
Support services, social interventions	III +	III +	III +
Education & self management	III +	III +	III +

Ia – IV grading of evidence	Nature of effect: + positive; 0 evidence of no effect; - negative effect
# inconsistent findings	IE inadequate evidence

Effect on Key Outcomes

Appropriate education and self-management (Level III), support services and social services (Level III) as well as braces, aids and devices (Level Ib) can prevent injuries or minimise tissue damage.

In the acute phase there is clear evidence that PRICE can limit tissue damage, pain and loss of function (Level Ib). Immobilisation might prevent further tissue damage and pain (Level Ib).

Function can be improved by a multi-disciplinary approach including joint mobilisation and specific exercises, education and support services as well as improved physical fitness (Level Ib – III).

Recommendations : Rehabilitative Interventions

To prevent trauma, the main recommendation is to maintain a level of physical fitness. Appropriate education and self-management (training in sports, driving lessons in traffic, education on the job) will decrease the number of accidents.

To reduce the impact of trauma-related tissue damage and pain protection (braces, aids and devices) are helpful.

In the early phase of trauma-related tissue damage and pain immobilisation and rest, ice, compression and elevation is of importance to limit the extent of the damage

In the later phase joint mobilisation, specific exercises, and muscle techniques play an important role for protection of further tissue damage due to contractions, muscle weakness and lost proprioception. Functional limitations will be limited and allow for appropriate activity and participation.

Multi-disciplinary approach to rehabilitation is recommended so that patient can return to sport with the ability to enjoy sport and prevent further injuries.

Key Recommendations for Musculoskeletal Trauma

Trauma	Population	Recommendation
All Injuries	At risk	
	Child	Remove external risks Educate to avoid risks Do not participate in traffic early Use safe playgrounds Identify child abuse and domestic violence
	Youth	Remove external risks Educate about traffic Obey traffic rules Use safety equipment in traffic Educate against the use of alcohol and drugs. Inform about occupational risks
	Working age	Remove external risks Identify and protect against risks with occupation Obey traffic rules Use safety equipment in traffic and work Maintain adequate physical activity and bone density Avoid excessive alcohol Avoid domestic violence
	Elderly	Remove external risks Maintain adequate fitness and bone density Implement falls protection programmes Use hip protectors Use safety equipment/safe walking aids
	Early Phase	Immediate professional care for severe injuries Early diagnosis and adequate treatment of potentially disabling injuries Avoid complications
	Late Phase	Adequate rehabilitation protocols Early mobilisation Regain physical fitness

Trauma	Population	Recommendation
Major Musculoskeletal Injuries	At risk	Remove external risks Modify environment (safe roads, work place etc.) Use correct equipment (safe vehicles, work tools, etc) Use protective equipment (safety belt, helmets, work place etc.) Education and training programs Obey rules and regulations Maintain physical fitness Avoid drugs and alcohol Establish fast and well-trained rescue chain
	Early Phase	Immediate accurate diagnosis and appropriate treatment on the scene Stabilization of basic life functions Systemic pain management Consider immobilisation, if unstable Early transportation to centre with appropriate experience and equipment Consider operative or non-operative stabilisation of fractures Consider immediate operative treatment if further deterioration is expected Consider adequate fluid and nutrition management Consider pulmonary, cardiovascular and neurological complications Prevent complications (infection, thrombosis, embolism, heterotopic ossifications) Start early mobilisation and rehabilitation
	Late Phase	Pain management incl. systemic and topical analgesics Consider definitive operative treatment, incl. <ul style="list-style-type: none"> - stabilisation, - reconstruction of biomechanics, - arthroplasty - replantation of limbs, - amputation, - plastic surgery Consider definitive non-operative treatment, incl. <ul style="list-style-type: none"> - use of aids, braces or devices - prosthetic devices Start early mobilisation and rehabilitation Consider reintegration into work process and society

Trauma	Population	Recommendation
Occupational Injuries	At risk	Uncover occupational risk factors Adaptation of work place and organization supported by laws Participation in accident awareness and prevention campaigns multi-disciplinary approach to educate participants on <ul style="list-style-type: none"> - the importance of physical fitness incl. basic aerobic fitness - the skills and techniques required by the particular sport - the nutritional requirements of the events - correct clothing and protective equipment obeying the rules Correct equipment Wear protective equipment
	Early Phase	Early accurate diagnosis and treatment. Pain management incl. systemic and topical analgesics Partial work restriction Consider short-term immobilisation Consider the use of aids, braces or devices Maintain physical fitness during the rehabilitation Understand the mechanism of injury and prevent future injuries by <ul style="list-style-type: none"> - considering adaptation work place - transferring the patient to another job - distinct job modification Return to work early
	Late Phase	Pain management incl. systemic and topical analgesics Partial work restriction Consider the use of aids, braces or devices Maintain physical fitness during the rehabilitation Understand the mechanism of injury and Prevent future injuries by <ul style="list-style-type: none"> - considering modification of task and work organization - transferring the patient to another job - distinct job modification Return to work early

Trauma	Population	Recommendation
Sports Injuries	At risk	Correct equipment Wear protective equipment Correct technique by qualified coaches Adequate supervision and facilities Obey Rules Prevention of dehydration and overuse Audit Injuries Maintain physical fitness
	Early Phase	Correct Diagnosis Remove from field of play Prevent further injury RICE and NSAIDs Referral for imaging, physiotherapy or orthopaedic clinic if necessary
	Late Phase	Early and adequate rehabilitation Correct any predisposing problems Must be pain free and have the muscle strength and skill required by the sport

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Part 4

What Should Be Done

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|---|--|
| <ul style="list-style-type: none"> 4.1 Introduction 4.2 Strategies for prevention <ul style="list-style-type: none"> Population based strategies Strategies for those at high risk Management of those with established musculoskeletal conditions 4.3 Health gain and health risks of any strategy 4.4 Who to target | <ul style="list-style-type: none"> 4.5 What are the implications for delivery of health and social care 4.6 What is the cost effectiveness 4.7 How to monitor effectiveness 4.8 Strategies for the whole population 4.9 Strategies for the at risk population 4.10 Strategies for those with early features of a musculoskeletal problem 4.11 Strategies for those with a musculoskeletal problem 4.12 Implications of implementation for different stakeholders |
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4.1 Introduction

Strategies have been developed for the prevention and management of musculoskeletal conditions. These bring together the evidence-based interventions that have been identified for the different conditions. Such strategies are aimed at the whole population to prevent these conditions where possible; at those individuals at highest risk of developing these conditions; and also at those who already have these conditions to reduce the impact that they have on them.

The strategies look for commonality of recommendations that will maintain or improve musculoskeletal health whatever the underlying condition. They also combine what can be achieved from evidence based interventions with what the different stakeholders want to be achieved with respect to their wishes and priorities. The stakeholders include those with musculoskeletal conditions and their carers and representatives; health care providers; health care purchasers and health policy makers. The potential gains and any risks of the strategies are identified both for musculoskeletal health and also for

other aspects of health. The resources in terms of systems, human and physical necessary for the implementation of these strategies are considered.

It is not possible to prioritise between the different strategies on the basis of evidence as the relevance, the effectiveness and the costs will vary depending on the population being considered and there is a lack of studies looking at the outcome of such strategies. In addition, the recommendations are broadly based and are not given for specific interventions. This is because there is a lack of comparative data to enable such specific recommendations to be made.

Health strategies need plans for implementation if they are to achieve their goals of improving health. Consideration is given to what is necessary for the different strategies to be implemented at the different levels – the political, employer, health and social care professional, the patient and their carer and at the public level.

4.2 Strategies for Prevention

Strategies for the prevention and management of musculoskeletal conditions can be aimed at

- the whole population
- those at high risk or with early features of the condition
- those with the established condition.

Population based strategies

Population based strategies entail identifying modifiable factors that influence the development or severity of musculoskeletal conditions and altering the prevalence of these determinants in the population. Evidence is needed of the risk associated with these determinants of health, if they can be modified and what is the benefit to the population if this is achieved. The intervention will be

targeted at the whole population and its benefits and risks have to be balanced accordingly. Safety is a priority over efficacy. Concordance has a major influence on effectiveness of this approach, as there is little incentive to change lifestyle or modify other determinants of health. This approach is largely dependent on health promotion initiatives.

Strategies for those at high-risk

A high-risk strategy entails identifying those individuals who are at most risk of the condition or a worse outcome from the condition and using an intervention to prevent or treat it to improve the outcome. Methods are needed to find those at highest risk, with early features of the condition or with bad prognostic features and treatments

are needed that have been shown to improve outcome. Efficacy is of increased importance but safety always remains of concern. Concordance is greater as there is more identification with the potential health problem. This approach is largely dependent on health care systems.

Management of those with established musculoskeletal conditions

The management of those with a musculoskeletal condition is important to prevent the condition from progressing. It entails diagnosis, assessing severity and likely prognosis and tailoring the evidence based

management accordingly. Concordance is greatest as the impact of the condition is evident and the cost effectiveness of any intervention is greater at this stage.

4.3 Health Gain and Health Risks of any Strategy

There are benefits and risks associated with any intervention or strategy. The benefits need to be considered in terms of quality of life for the individual, for example, the ability to do what they wish to do with as little difficulty as possible, as well as reducing the burden of disease on society. Increased independence of people means less need for health and social care as well as less support from carers. The specific benefits of the different strategies are given, including those outside musculoskeletal health. It is also necessary to consider how soon any benefit is likely to be seen when trying to evaluate a strategy. This is considered in the recommendations.

Any intervention is not without risks. There are risks and side effects associated with screening and diagnostic tests and pharmacological, surgical or rehabilitative

interventions. There are also risks associated with implementing any healthy living strategies, for example, encouraging people to participate in physical exercise will increase their risk of trauma. These should be balanced by benefits in preventing disease, disability and improving quality of life. A test that suggests someone is at risk of a condition may result in anxiety about health – making healthy people sick. Any such strategy of identifying people at risk or with early features of a musculoskeletal condition must have clear potential positive benefits to health. Interventions that may be used to prevent or treat a condition may also have potential detrimental effects. Any decision therefore to participate in a screening or diagnostic test or to accept an intervention must be a fully informed decision and these must be considered when adopting any strategy for implementation.

4.4 Who to target

Benefit from any strategy will be greatest for those who are at increased risk of developing the condition or having a poor outcome from it. For example, increasing physical activity in those who already undertake regular exercise gives little additional benefit, but increasing it in those who are physically inactive will be of significant benefit.

For the successful implementation of any strategy, it therefore needs to be clear who will benefit most and how best to identify them in practical terms. In addition, those people need to have an understanding of their personal risk and the need for them to take positive actions to reduce that risk.

4.5 What are the implications for the delivery of health and social care

The implementation of any of the recommended strategies will require resources. These may be considered in terms of the health systems needed to deliver them and also in terms of specific resources - human, physical and financial.

Health care can be provided in the community, primary care and secondary care. Some strategies such as health promotion will be undertaken mainly in the community where the services will need to be. Strategies to identify those at high risk or at the early stages of the condition will be predominantly undertaken in the community and in primary care, but systems for diagnosis and assessment may need to be set up within secondary care. More effective treatment of those with established conditions might need to be focused around secondary care but may be delivered as a seamless service between primary and secondary care by an integrated multi-disciplinary service. Interventions such as surgery clearly need good secondary care facilities but the outcomes will be improved if this is in a multi-disciplinary setting with access to rehabilitation both in secondary care and in the community. The trend of hospitals being focused around acute care has reduced access to intermediate care in some health systems. The provision of intermediate care may be an effective way of delivering some of the recommended strategies. The full involvement of people in their own care may also have implications as to how care is delivered. Such changes in the systems of delivering high quality care do not necessarily require additional resources, but the needs may be met by reorganisation of existing resources – human, physical and organisational. For example, self-

management strategies can reduce the service demands on primary and secondary care.

There are also specific resource implications (table 4.1). Appropriately trained personnel will be necessary for most interventions, from health promotion to the ability to perform a hip joint replacement. They not only require the provision of appropriate training and continuing professional development but they also require the necessary physical facilities and working environment to achieve their goals. The provision of such services requires economic resources. The success of such services requires people to use them. This requires an understanding amongst the population as a whole of the need to take positive actions to improve their health as well as having a positive attitude about what can be achieved. This can be achieved through public education.

There also needs to be a commitment at the political level to give priority and financial resources, and also at the professional level to ensure recognition of need and access to appropriate care. There are many effective interventions for musculoskeletal conditions, pharmaceutical, rehabilitative and surgical, but access to some is restricted largely related to costs. There is a need to consider these against the longterm costs of the condition if not treated more effectively.

To enable the full implications of any strategy to be understood, the actions that are most important for the successful implementation of the different strategies are given in the subsequent tables.

Table 4.1 Resource implications for delivery of health and social care

Resource Implications		
Category		
Health care	Personnel	People Skills (training and CPD)
	Services & facilities	Community care Primary care Specialist outpatient care Specialist inpatient care Surgery (day or inpatient) Emergency room Rehabilitation service (physiotherapist, occupational therapist, social worker etc) Devices and aids
Personal	Support	Diagnostic procedures and tests Medication (prescription and non-prescription)
		Self care (carers / services) Home care (carers / services) Family care (carers / services) Transportation
Home		Environmental adaptations
Productivity		Flexible working (compensation) Sick leave (paid) Early retirement (pension) Disability benefits (compensation)

4.6 What is the cost effectiveness

Priorities have to be made in health care and health economic tools are frequently used in this context. It is difficult however to use these at present when trying to make choices for strategies to prevent musculoskeletal conditions and to improve their outcomes. There is currently little information on cost effectiveness for population-based strategies. There is some evidence for high-risk strategies and more data for specific interventions for those with various musculoskeletal conditions. However there are few data for the use of such interventions within an integrated strategy. Given the tremendous costs of health care utilisation and work absenteeism associated with musculoskeletal conditions from their earliest stages, it is clear that interventions that reduce incidence, chronicity,

recurrences and limitation of activities will have a huge impact on cost reduction. The economic benefits can be measured in terms such as reduced medical and social care and return to employment. In addition, many of the recommended strategies do not require expensive technologies or have additional health benefits. They are therefore likely to be cost effective.

To decide which approaches are most cost effective and to prioritise between other disease areas requires more economic evaluations. Such research is strongly recommended. In the absence of the research a simple economic matrix is given below which can act as an aid in deciding implementation priorities.

Table 4.2 Economic matrix to aid implementation decisions (1)

		Comparative Health Benefit		
		<i>Higher</i>	<i>Similar</i>	<i>Lower</i>
Comparative Resource Use	<i>Higher</i>	<i>Maybe</i> Prioritised reserve list	<i>Maybe</i> Put on hold	<i>No</i> Do not pursue
	<i>Similar</i>	<i>Yes</i> Phased implementation	<i>Maybe</i> Examine further	<i>No</i> Do not pursue
	<i>Lower</i>	<i>Yes</i> Implementation immediately	<i>Yes</i> Manage Implementation	<i>Maybe</i> Further analysis benefits & costs

The matrix indicates that if a new or existing treatment carries significant healthcare benefits and consumes fewer health care resources, it should be implemented immediately.

4.7 How to monitor effectiveness

Indicators are needed that can be used to measure the implementation of the recommended strategies and the effect they have on health. A set of indicators that can be used across the European community for measuring and monitoring the impact of musculoskeletal conditions has been recommended in the European Commission Report “Indicators for Monitoring Musculoskeletal Problems and Conditions” (Grant no.

S12.297217). These indicators need to be applied across Europe to monitor the impact of these strategies. [http://europa.eu.int/comm/health/ph_projects/2000/monitoring/fp_monitoring_2000_frep_01_en.pdf].

4.8 Strategies for the whole population

Strategy

To reduce the enormous impact on the quality of life of individuals and socio-economic impact on society related to musculoskeletal conditions, people at all ages should be encouraged to follow a healthy lifestyle and to avoid the specific risks related to musculoskeletal health.

Interpretation

For musculoskeletal conditions this means:

- Physical activity to maintain physical fitness
- Maintaining an ideal weight
- A balanced diet that meets the recommended daily allowance for calcium and vitamin D
- The avoidance of smoking
- The balanced use of alcohol and avoidance of alcohol abuse
- The promotion of accident prevention programmes for the avoidance of musculoskeletal injuries
- Health promotion at the workplace and related to sports activities for the avoidance of abnormal use and overuse of the musculoskeletal system
- Greater public and individual awareness of the problems that relate to the musculoskeletal system. Good quality information on what can be done to prevent or effectively manage the conditions and the need for early assessment

Rationale

Lifestyle and other risk factors are important in the development and severity of musculoskeletal conditions. Modification of these lifestyle and other risk factors will improve the musculoskeletal health of the population. Some conditions will be prevented and the outcome of other musculoskeletal conditions will be improved with less pain and disability.

These lifestyle factors (Figure 2.1) are also associated with other conditions, mainly chronic, such as heart disease and cancers and their modification will therefore have additional health benefits.

Physical activity

Recommendation

People at all ages should achieve and maintain the optimum level of physical activity and fitness within their own personal limitations.

A target for physical activity for an average sedentary adult is engaging in at least 30 minutes of physical activity of moderate intensity, such as a brisk walk, every day or on most days of the week (2;3;4), but may need to be individualised for those who have limited mobility. Specific exercises have a role for improving activities related to the daily requirements of the individual.

Justification

Physical activity is important for musculoskeletal health. It helps build and maintain healthy bones, muscles, and joints. It will have a beneficial effect on osteoarthritis, back pain and its chronification, and has beneficial effects on bone mineral density and muscle strength. Falls and musculoskeletal injuries may be prevented through maintaining physical fitness and muscle strength through appropriate exercises. Physical exercise is also important in achieving weight loss.

The other health benefits of exercise are:

- 50% reduction in the risk of developing coronary heart disease, non-insulin dependent diabetes and obesity
- 30% reduction in the risk of developing hypertension
- decline in blood pressure among hypertensive people, reducing levels of mild to moderate hypertension
- improving balance, coordination, mobility, strength and endurance
- increasing self-esteem
- promoting overall psychological well being
- helps control weight.

Ideal body weight**Recommendation**

People at all ages should maintain their weight so that they are within the recommended healthy body mass index (between 19 kg/m² and 25 kg/m²). (the risks of disease in all populations can increase progressively from lower BMI levels)

Justification

An ideal body weight is important for musculoskeletal health. Obesity is associated with the development, progression and symptomatic severity of osteoarthritis of the knee. A modest weight loss of 4 to 7 kilograms is likely to relieve symptoms and delay disease progression of knee OA. Pain in rheumatoid arthritis can be reduced by weight reduction. Severe obesity may play a part in aggravating a simple low back problem, and contribute to a long-lasting or recurring condition.

A low body weight is an established risk factor for osteoporosis and for excess mortality following a fracture.

The other health benefits of an ideal weight are:

- Reduces the risk of premature death.
- Reduces the risk of dying from heart disease.
- Reduces the risk of developing diabetes.
- Reduces the risk of developing high blood pressure.
- Helps reduce blood pressure in people who already have high blood pressure.
- Reduces the risk of developing colon cancer.
- Reduces feelings of depression and anxiety.
- Reduces respiratory difficulties
- Reduces skin problems
- Reduces risk of infertility

In analyses carried out for the World Health Report 2002, approximately 58% of diabetes and 21% of ischaemic heart disease and 8-42% of certain cancers globally were attributable to a BMI above 21 kg/m².

Nutrition**Recommendation**

A balanced diet is recommended at all ages that meets the recommended daily allowance for calcium (at least 800mg per day) and fish oils. This is most important during the phases of growth and development and also in the elderly. In individuals at risk of vitamin D deficiency due to insufficient exposure to ultraviolet irradiation, adequate vitamin D intake (400 IU up to 800 IU daily in the frail elderly) is recommended.

Justification

Diet is important in both the prevention and progression of musculoskeletal conditions. Higher levels of calcium intake are associated with higher bone density, in particular higher dietary intake in childhood has been associated with higher bone density in adult life. Older people in general have low calcium intake and the frail elderly are often deficient in vitamin D. In this population calcium and vitamin D supplementation may prevent fracture. Good general nutrition is also important in recovery from hip fracture.

A balanced diet is important in maintaining an ideal body weight. A balanced diet must contain carbohydrate, protein, fat, vitamins, mineral salts and fibre. It must contain these things in the correct proportions. The other health benefits of a balanced diet that meets the recommended allowances are:

- Consumption of fruit and vegetables reduces the risk of chronic diseases
- Reduces the risk of heart disease
- Reduces the risk of cancer

Smoking

Recommendation

The avoidance of smoking is recommended

Justification

Smoking is associated with rheumatoid arthritis, osteoporosis and fracture and is related to back pain.

The avoidance of smoking may reduce the incidence of rheumatoid arthritis, osteoporosis and back pain. Currently there are no data on the reduction of risk after stopping smoking.

Tobacco smoking is harmful not only to the individual smoker but, because of passive smoking, also to others. Smoking is associated with a wide range of diseases. These include ischaemic heart disease, stroke, chronic bronchitis, emphysema, cancers (lung, bladder and kidney, pancreas, oral cavity, pharynx, larynx, oesophagus, body of the uterus and cervix of the uterus), aortic aneurysm, atherosclerotic peripheral disease, peptic ulcers, low birth weight babies, sudden infant death (SIDS) and lower fertility. Passive smoking contributes to SIDS, low birth weight, acute respiratory illness in early childhood, reduced lung function in children and adults, increased lung symptoms in asthmatics, decreased lung function in asthmatics, lung cancer and ischaemic heart disease. About 90 % of lung cancers, 80 % of chronic obstructive lung disease and 25 % of heart disease deaths are associated with smoking. Smoking represents the largest single determinant of avoidable deaths. Smoking-associated female deaths are still increasing (5).

Alcohol abuse

Recommendation

The avoidance of excess alcohol consumption is recommended.

Justification

Excess alcohol is associated with accidents on the road, in the workplace and with falls, osteoporosis and fractures. Excess alcohol is estimated at input of 60g/day.

Alcohol is also another important health determinant amenable to policy intervention. Although at present there is no good indicators for alcohol-related deaths that have been agreed upon (a Eurostat task force is working on it), there is, nevertheless, a strong relation between accidents with a fatal outcome on European roads and alcohol abuse. In some European countries there is an important alcohol effect on the suicide rates of males (Belgium, Austria, Portugal, Finland and Sweden) and females (Belgium, Germany, Netherlands, Austria and Sweden). Homicide rates are also influenced by alcohol drinking patterns. *Per capita* consumption is a key factor in explaining changes in cirrhosis mortality for men and women and for different age groups. Alcohol also contributes to cancer of the mouth and of the oesophagus. Sustained heavy drinking progressively increases the risk of raised blood pressure and stroke and the possibility of ischaemic heart disease. Excessively high consumption substantially increases the risk of ischaemic heart disease although, if taken moderately can reduce its risk. Alcohol abuse during pregnancy also results in an increased number of children born with foetal alcohol syndrome.

The health benefits of avoiding alcohol abuse can be summarised as:

- Reduces the risk of liver cirrhosis
- Reduces the risk of raised blood pressure
- Reduces the risk of heart disease
- Reduces the risk of stroke
- Reduces the risk of pancreatitis
- Reduces the risk of cancers of the oropharynx, larynx, oesophagus, stomach, liver and rectum.
- Reduces the risk of family, work and social problems
- Reduces the risk of road traffic accidents with a fatal outcome
- Reduces the risk of suicide in some European countries

The amount that may be of benefit, helping to prevent cardiovascular damage and improve overall survival, is half a glass of red wine per day.

Accidents prevention

Recommendation

Actions are recommended to prevention accidents, in particular related to:

- sports activities
- occupation
- participation in traffic
- fall prevention in the elderly

These may include accident prevention campaigns or be through regulations and laws.

Justification

Prevention of accidents, such as by creating safe communities, will reduce musculoskeletal trauma and its consequences, including osteoarthritis, specific back pain due to injury and fractures as a result of underlying osteoporosis and long term disability.

The other health benefits of avoiding accidents are:

- Reduces the risk of premature death
- Reduces the risk of developing complications, such as infection, thrombosis, embolism
- Reduces number of sick days and early retirements

Abnormal use and overuse of the musculoskeletal system

Recommendation

Abnormal use or overuse of the musculoskeletal system needs to be recognised and prevented. This includes reducing workplace exposure and correct training for occupational activities (e.g. repetitive tasks, lifting) and sports activities. In addition, structural or functional abnormalities of the musculoskeletal system (e.g. hip dysplasia in the newborn, scoliosis and foot deformities in the adolescent or malalignment of leg axis) need to be recognized early and addressed as appropriate.

Justification

Prevention of abnormal and overuse of the musculoskeletal system will reduce regional pain problems, osteoarthritis and back pain as well as musculoskeletal injuries related to sports and occupational activities. Excessive exercise can lead to sex hormone deficiency and osteoporosis. The longterm consequences of structural or functional abnormalities of the musculoskeletal system such as hip dysplasia and malalignment (osteoarthritis of the knee and hip), scoliosis (back pain) and foot deformities (osteoarthritis) may be prevented.

The other health benefit of avoiding abnormal or overuse of the musculoskeletal system will be reduced number of sick days and early retirements.

Raising public and individual awareness

Recommendation

Raise public and individual awareness of the problems that relate to the musculoskeletal system, what can be done to prevent or manage the conditions and the need for early assessment.

Justification

Increased awareness of the problems related to the musculoskeletal system and of the treatment options that are available to prevent and treat them is important. This will encourage people to take actions to reduce their own risks, presenting sooner if they develop early features of a condition and they will also help identify and advise others at risk.

Health gains and risks

These measures may reduce the development of musculoskeletal conditions such as osteoarthritis, osteoporosis and back pain, reduce the occurrence of injuries and accidents, and improve the outcome of various musculoskeletal conditions. However, as the attributable risk of these various lifestyle factors is not overall great and many of them are difficult to reverse, the overall reduction in the burden of musculoskeletal conditions will not be great. Getting people to follow healthier lifestyles is one of our major health challenges. Some interventions have more potential for musculoskeletal health gain such as people maintaining an ideal weight and keeping physically active. These also have other major health benefits and are already being promoted across the European Community.

In general there are no major health risks associated with this strategy provided the recommendations are undertaken in a way that is suitable for the individual. For example, any physical activity programme must be appropriate for the age and physical abilities of the individual.

It is not yet possible to estimate the avertable burden of disease related to these interventions or the costs of their implementation. Concordance is usually poor to such change of lifestyle recommendations and there is a great need for individual responsibility for them to be effective. However, the additional benefits to most of these interventions for health as a whole will increase their clinical and cost effectiveness.

Benefits of some of these interventions will be seen within 5 years, such as increasing calcium and vitamin D intake in the very elderly, but many need to be implemented throughout life with the greatest benefits in the later years.

What resources are required?

The implementation of these recommendations will require changes in behaviour as well as resources to encourage and facilitate them. This ranges from educational programmes, better access to sports facilities, laws and financial incentives. The requirements for implementation are considered in more detail on pages 171-176.

4.9 Strategies for the at risk population

Strategy

To prevent the enormous impact on the quality of life of individuals and socio-economic impact on society related to musculoskeletal conditions, those at greatest risk must be identified and encouraged to take measures to reduce their risk. This should be on a background of being encouraged to follow a healthy lifestyle and to avoid the specific risks related to musculoskeletal diseases.

Interpretation

This requires a case finding approach for the different musculoskeletal conditions aimed at identifying those individuals who are most at risk of future problems related to musculoskeletal diseases and who will benefit from evidence-based interventions.

The following case-finding approaches are recommended:

Condition	How to identify those at highest risk who will benefit from intervention (case finding strategy)
Osteoarthritis	Those deemed most at risk, who include people aged 50+ years, obesity, abnormal biomechanics (e.g. identify newborns at risk of hip dysplasia), a history of joint injury, intense sporting activities or certain occupations.
Rheumatoid arthritis	Those with early inflammatory arthritis should be identified and assessed as soon as possible, as many will progress to develop rheumatoid arthritis.
Back pain	All adults should be considered at risk. Back pain is very common and it is not yet possible to identify those in the community at greater risk of developing back pain with sufficient sensitivity or specificity to make any recommendations. "Yellow flags" for persistence or recurrence need to be looked for.
Osteoporosis	Assessment of fracture probability should be performed using risk factor profiling (e.g. older people (>65 years); men and women with strong risk factors such as untreated hypogonadism, previous low trauma fracture, glucocorticoid therapy, BMI <19 kg/m ² , maternal history of hip fracture, excess alcohol and smoking) and, where indicated, bone density assessment.
Major musculoskeletal injuries	The whole population should be considered at risk, particularly those participating in traffic, high risk occupation or leisure activities.
Occupational musculoskeletal injuries	The whole working population should be considered at risk, particularly those exposed to repetition, high force, awkward joint posture, direct pressure, vibration, prolonged constrained posture or psychological factors such as psychological demand, stress, etc.
Sports injuries	The whole population that participates in physical activity or sport is at risk, particularly the physically unfit person if they try to do too much, too quickly. Participants in contact sports, where the wrong body type for the sport, the level of expertise and experience differ and the rules of the sport are not observed In the rehabilitation phase the risk for a new injury is increased.

Justification

Such a case-finding approach is the most cost effective way of preventing musculoskeletal conditions and reducing their potential impact on people and societies. Earlier identification and appropriate management at this stage can result in improved outcome of these musculoskeletal conditions.

Strategies for the specific musculoskeletal conditions**OSTEOARTHRITIS - Strategy for the Population at Risk**

How to identify	Those deemed most at risk, who include people aged 50+ years, obesity, abnormal biomechanics (e.g. identify newborns at risk of hip dysplasia), a history of joint injury, intense sporting activities or certain occupations.
Intervention recommended	For the population deemed to be at risk, there should be programmes to promote the importance of avoiding obesity, a gain in physical fitness and access to both preventative surgical interventions and rehabilitation.
Health gain	A decreased incidence and severity of degenerative joint diseases and of cardiovascular disease. Physical fitness may reduce the risk of trauma. All individuals who are at increased risk of osteoarthritis (see above) and society, as a whole would benefit and the benefits would be within 5 years.

RHEUMATOID ARTHRITIS - Strategy for the Population at Risk

How to identify	Those with early inflammatory arthritis should be identified and assessed as soon as possible, as many will progress to develop rheumatoid arthritis.
Intervention recommended	People with three or more persistently inflamed joints should be assessed expertly as soon as possible, at least within 6 weeks of onset of symptoms. If diagnosed as rheumatoid arthritis, early treatment is recommended (see page 163).
Health gain	A decrease in the severity of RA. The benefit for those with early inflammatory arthritis and society a whole would be within 1-3 years.

BACK PAIN - Strategy for the Population at Risk

How to identify	All adults should be considered at risk. Back pain is very common and it is not yet possible to identify those in the community at greater risk of developing back pain with sufficient sensitivity or specificity to make any recommendations. "Yellow flags" for persistence or recurrence need to be looked for. Chronic back pain is different and is linked with various risk factors.
Intervention recommended	There should be a strategy to encourage the population to change behaviour and beliefs about back pain and on the importance of undertaking moderate exercise several times per week.
Health gain	A reduction in the severity and occurrence of back pain. The potential benefit would be great because of the high prevalence of back pain.

OSTEOPOROSIS - Strategy for the Population at Risk

How to identify	Assessment of fracture probability should be performed using risk factor profiling (e.g. older people (>65 years); men and women with strong risk factors such as untreated hypogonadism, previous low trauma fracture, glucocorticoid therapy, BMI <19 kg/m ² , maternal history of hip fracture, excess alcohol and smoking) and, where indicated, bone density assessment.
Intervention recommended	For the at risk population education and lifestyle advice should be provided, together with the correction of calcium and vitamin D deficiency and risk factor modification where possible. Case-finding strategies should be implemented to identify individuals with a high fracture probability. Interventions should be initiated for those with a high fracture probability as outlined in the next 2 sections.

Health gain	A reduction of age related bone loss and fracture risk. Multiple benefits will be associated with the avoidance of tobacco use and alcohol abuse. The benefit will be greatest for individuals with high fracture probability, identified through risk factor profile and assessment of bone mineral density. The onset of benefits would be within 5 years.
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MAJOR MUSCULOSKELETAL INJURIES - Strategy for the Population at Risk

How to identify	The whole population should be considered at risk, particularly those participating in traffic, high risk occupation or leisure activities.
Intervention recommended	<p>Identification of risk factors</p> <p>Create safe communities by</p> <ul style="list-style-type: none"> • removing external risks • modifying the environment (safe roads, work place etc.) • using correct equipment (safe vehicles, work tools, etc) • using protective equipment (safety belt, helmets, work place etc.) • education and training programs • obeying rules and regulations • maintaining physical fitness • avoiding drugs and alcohol • establishing fast and well-trained rescue chain
Health gain	A decreased incidence and severity of major musculoskeletal injuries to the benefit of all participants in traffic, high risk occupation or leisure activities and society as a whole.

OCCUPATIONAL INJURIES - Strategy for the Population at Risk

How to identify	The whole working population should be considered at risk, particularly those exposed to repetition, high force, awkward joint posture, direct pressure, vibration, prolonged constrained posture or psychological factors such as psychological demand, stress, etc.
Intervention recommended	<p>Identification of occupational risk factors</p> <p>Adaptation of work place and organisation</p> <p>Participation in accident awareness and prevention campaigns</p> <p>Multi-disciplinary approach to educate participants on:</p> <ul style="list-style-type: none"> • the importance of physical and psychological fitness • the skills and techniques required by the particular work • the nutritional requirements of the events • correct clothing and protective equipment • obeying the rules
Health gain	A decreased incidence of work-related injuries, of number of days absent from work and of early retirements amongst participants in demanding occupational positions.

SPORTS INJURIES - Strategy for the Population at Risk

How to identify	<p>The whole population that participates in physical activity or sport is at risk, particularly the physically unfit person if they try to do too much, too quickly.</p> <p>Participants in contact sports, where the wrong body type for the sport, the level of expertise and experience differ and the rules of the sport are not observed</p> <p>In the rehabilitation phase the risk for a new injury is increased.</p>
Intervention recommended	<p>Identification of risk factors</p> <p>Multi-disciplinary approach to educate participants on:</p> <ul style="list-style-type: none"> • the importance of physical fitness including basic aerobic fitness

-
- the skills and techniques required by the particular sport
 - the nutritional requirements of the events
 - correct clothing and protective equipment
 - obeying the rules
-

Health gain A decreased incidence and severity of injuries. An increased physical fitness will decrease incidence of cardiovascular disease. This will benefit all participants in physical activities or sport

What resources are required?

The implementation of these recommendations will require changes in behaviour by both the public and patients as well as by health professionals. Implementation will require programmes to raise awareness of the importance and benefit of early interventions; the promotion of lifestyle changes that benefit musculoskeletal health; and systems for the early recognition and management of those with the earliest features of musculoskeletal conditions such as inflammatory arthritis, osteoporosis and musculoskeletal injuries.

4.10 Strategies for those with the early features of a musculoskeletal problem

Strategy

To prevent the enormous impact on the quality of life of individuals and the socio-economic impact on society related to musculoskeletal conditions, those with earliest features of a musculoskeletal condition should receive an early and appropriate assessment of the cause of their problem. Once their needs have been identified they should receive early and appropriate management and education in the importance of self-management.

Interpretation

This requires methods to ensure that those who have the earliest features of the different musculoskeletal conditions are assessed by someone with the appropriate competency and that the person should have timely access to care that is appropriate to their needs.

The following approaches are recommended for early assessment and management to achieve the best outcomes. These are on a background of

- enabling people to recognise the early features of musculoskeletal conditions and to know what to do, either managing the problem themselves or knowing when to seek appropriate professional help
- enabling people to access the skills necessary to manage and take responsibility for their own condition in the long term and to be able to lead full and independent lives.

Condition	How to assess and manage those with the earliest features of a musculoskeletal condition (early action strategy)
Osteoarthritis	<p>The strategies outlined for those at risk should be undertaken including education programs to encourage self management. This should include information on the condition, lifestyle and its treatment.</p> <p>There should be pain management including the use of topical analgesics, simple analgesics and NSAIDs.</p> <p>Normal biomechanics should be restored, including osteotomy, ligament and meniscal surgery where indicated.</p> <p>Environmental adaptations in the home and workplace and the use of aids, braces or devices should be considered.</p> <p>The use of glucosamine sulphate, chondroitin sulphate or hyaluronic acid and of I/A therapies (including corticosteroids, hyaluronic acid and tidal irrigation) should be considered.</p>
Rheumatoid arthritis	<p>For those with the early stages of rheumatoid arthritis it is important that a correct diagnosis is made by expert assessment within 6 weeks of onset of symptoms.</p> <p>Disease modifying anti-rheumatic drug (DMARD) treatment should be started in addition to symptomatic therapy and rehabilitative interventions as soon the diagnosis of rheumatoid arthritis is established. The choice of treatment should take into account the presence of prognostic indicators supporting the use of more aggressive therapy. Treatment should be closely monitored to ensure ideal disease control.</p> <p>There should be education programmes to encourage self management. These should include information on the condition, lifestyle and its treatment</p> <p>Treatment should consider all aspects of the effect of the condition on the person.</p> <p>People with rheumatoid arthritis should be enabled to participate as fully as possible through rehabilitation and modification of the work, home and leisure environment.</p>

Back pain	<p>There should be a strategy to encourage the population to change behaviour and beliefs about back pain and on the importance of maintaining physical activity and employment by those with acute or subacute back pain.</p> <p>On a background of public awareness, health care professionals should learn to follow the appropriate guidelines which recommend staying active; avoiding bed rest; using paracetamol, NSAIDs or manual therapy and addressing “red” and “yellow” flags.</p>
Osteoporosis	<p>For the population with osteoporosis (BMD T score ≤ -2.5) there should be educational and lifestyle advice programmes.</p> <p>For those identified as having a high risk of fracture there should be appropriate pharmacological interventions.</p> <p>For older people at high risk of falling there should be in addition a falls prevention programme.</p>
Major musculoskeletal injuries	<p>There should be immediate accurate diagnosis and appropriate treatment on the scene.</p> <p>In addition there should be stabilisation of basic life functions; systemic pain management; consideration of immobilisation, if unstable; early transportation to centre with appropriate experience and equipment.</p> <p>Consider operative or non-operative stabilisation of fractures; immediate operative treatment if further deterioration is expected; adequate fluid and nutrition management; pulmonary, cardiovascular and neurological complications.</p> <p>Prevent complications (infection, thrombosis, embolism, heterotopic ossifications).</p> <p>Start early mobilisation and rehabilitation.</p>
Occupational musculoskeletal injuries	<p>There should be early accurate diagnosis and treatment.</p> <p>In addition there should be pain management including systemic and topical analgesics; partial work restriction.</p> <p>Consider short-term immobilisation and the use of aids, braces or devices.</p> <p>Maintain physical fitness during rehabilitation.</p> <p>Understand the mechanism of injury and prevent future injuries by considering adaptation work place, transferring the patient to another job or distinct job modification.</p> <p>Return to work early.</p>
Sports injuries	<p>There should be early accurate diagnosis and treatment.</p> <p>RICE - rest, ice, compression and elevation.</p> <p>Pain management including systemic and topical analgesics.</p> <p>Consider immobilisation, if unstable – early mobilisation, if stable; the use of aids, braces or devices; immediate operative treatment if further deterioration is expected; operative reconstruction of tendons, capsule and ligaments; operative or non-operative stabilisation of fractures.</p> <p>Maintain physical fitness during rehabilitation.</p> <p>Return to sport when pain free and able to carry out all skills required by the sport.</p> <p>Understand the mechanism of injury and prevent future injuries.</p> <p>Consider adaptation of special technique in sport.</p>

Justification

Such an early action approach is the most cost effective way of reducing the potential consequences and impact of musculoskeletal conditions on people and societies

Strategies for the specific musculoskeletal conditions

OSTEOARTHRITIS – Strategy for the Population with Early or Mild Osteoarthritis	
How to identify	Those suffering from episodic pain and/or stiffness of knee, hip or hand(s)
Interventions recommended	<p>The strategies outlined for those at risk should be undertaken including education programs to encourage self management. These should include information on the condition, lifestyle and its treatment.</p> <p>There should be pain management including the use of topical analgesics, simple analgesics and NSAIDs.</p> <p>Normal biomechanics should be restored, including osteotomy, ligament and meniscal surgery where indicated.</p> <p>Environmental adaptations in the home and workplace should be considered.</p> <p>The use of aids, braces or devices should be considered.</p> <p>The use of glucosamine sulphate, chondroitin sulphate or hyaluronic acid should be considered.</p> <p>The use of I/A therapies (including corticosteroids, hyaluronic acid and tidal irrigation) should be considered.</p>
Health gain	This will lead to a decreased severity and impact of degenerative joint diseases. The individual patient will have a decrease in pain and stiffness and their mobility, independence and quality of life will improve. There will also be a decreased incidence and severity of cardiovascular disease secondary to increased physical activity and decreased obesity. The benefits from pain control will begin immediately.
RHEUMATOID ARTHRITIS – Strategy for the Population with Early Rheumatoid Arthritis	
How to identify	The population with early stage rheumatoid arthritis (less than 3 months duration) as defined by the ACR criteria
Interventions recommended (see other recommendations for established rheumatoid arthritis)	<p>For those with the early stages of rheumatoid arthritis it is important that a correct diagnosis is made by expert assessment within 6 weeks of onset of symptoms.</p> <p>Disease modifying anti-rheumatic drug (DMARD) treatment should be started in addition to symptomatic therapy and rehabilitative interventions as soon the diagnosis of rheumatoid arthritis is established. The choice of treatment should take into account the presence of prognostic indicators supporting the use of more aggressive therapy. Treatment should be closely monitored to ensure ideal disease control.</p> <p>There should be education programmes to encourage self management. These should include information on the condition, lifestyle and its treatment</p> <p>Treatment should consider all aspects of the effect of the condition on the person.</p> <p>People with rheumatoid arthritis should be enabled to participate as fully as possible through rehabilitation and modification of the work, home and leisure environment.</p>
Health gain	This will lead to a decreased number of patients with severe destructive RA; decrease in pain and improvement in function of the individuals; decrease in co-morbidities for example, cardiovascular diseases; and decrease in the long term consequences of the disease, e.g. amyloidosis. This will benefit all patients with RA and society as a whole. The benefits will begin immediately from disease and symptom control and increase with time compared to untreated disease.

BACK PAIN – Strategy for the Population with Early Stage Back pain

How to identify	The population that has non-specific low back pain. This includes acute or subacute non-specific back pain as well as back pain that lasts less than twelve weeks but with frequent recurrences
Interventions recommended	There should be a strategy to encourage the population to change behaviour and beliefs about back pain and on the importance of maintaining physical activity and employment by those with acute or subacute back pain. On a background of public awareness, health care professionals should learn to follow the appropriate guidelines which recommend staying active; avoiding bed rest; using paracetamol, NSAIDs or manual therapy and addressing “red” and “yellow” flags.
Health gain	This will result in reduced pain, improved functioning and maintaining employment. Effective management of acute and subacute non-specific back pain will reduce the enormous burden associated with the transfer of those with acute to chronic back pain. The benefit will be for those with acute or subacute non-specific back pain and society as a whole and will be seen immediately from better pain management and within a few years from changes in beliefs and behaviour.

OSTEOPOROSIS – Strategy for the Population with Osteoporosis

How to identify	Men and women with a BMD T score at the spine and/or hip of ≤ -2.5
Interventions recommended	For the population with osteoporosis (BMD T score ≤ -2.5) there should be educational and lifestyle advice programmes. For those identified as having a high risk of fracture there should be appropriate pharmacological interventions. For older people at high risk of falling there should be in addition a falls prevention programme.
Health gain	A reduction in age-related bone loss, fracture risk and improved function and mobility. There will be multiple benefits associated with avoidance of tobacco and alcohol abuse. Drug-related side-effects may occur with all pharmacological interventions, for example bisphosphonates may be associated with gastrointestinal side-effects. If HRT is used, improvement in menopausal symptoms if present and reduction in colon cancer and increased risk of breast cancer, thromboembolic disease and cardiovascular disease. If raloxifene used, reduction in breast cancer risk. Those with high fracture probability will benefit most, in whom treatment with most antiresorptive agents is cost effective. The reduction in fracture risk is seen within 1-2 years and benefits will be longterm provided the intervention is maintained.

MAJOR MUSCULOSKELETAL INJURIES**Strategy for the Population in the Early Phase of Major Musculoskeletal Injuries**

How to identify	Those suffering from severe musculoskeletal injuries in the very early phase
Interventions recommended	Immediate accurate diagnosis and appropriate treatment on the scene. Stabilisation of basic life functions. Systemic pain management. Consider immobilisation, if unstable. Early transportation to centre with appropriate experience and equipment.

Consider operative or non-operative stabilisation of fractures.
 Consider immediate operative treatment if further deterioration is expected.
 Consider adequate fluid and nutrition management.
 Consider pulmonary, cardiovascular and neurological complications.
 Prevent complications (infection, thrombosis, embolism, heterotopic ossifications).
 Start early mobilisation and rehabilitation.

Health gain A reduction in mortality and morbidity of patients with major injuries with decreased pain and functional limitation, and increased activity and participation. This will most benefit the individual from the very early stage of major musculoskeletal injury.

OCCUPATIONAL INJURIES – Strategy for the Population with Early Stage Occupational Injuries

How to identify Those suffering from episodic pain, stiffness, tingling, clumsiness, loss of co-ordination, loss of strength, skin discoloration, and temperature differences in relation to their work environment and work performance

Interventions recommended Early accurate diagnosis and treatment.
 Pain management incl. systemic and topical analgesics.
 Partial work restriction.
 Consider short-term immobilisation.
 Consider the use of aids, braces or devices.
 Maintain physical fitness during the rehabilitation.
 Understand the mechanism of injury.
 Prevent future injuries by:

- considering modification of task and work organisation
- use of specific tools
- improvement of ergonomic design

Return to work early.

Health gain A decreased severity and improved outcome of work-related injuries with a decrease in number of days absent from work and early retirements. This will most benefit the individual with the early phase of work-related injuries.

SPORTS INJURIES – Strategy for the Population with Early Stage Sports Injuries

How to identify Those in the early post-traumatic phase

Interventions recommended Early accurate diagnosis and treatment.
 RICE - rest, ice, compression and elevation.
 Pain management including systemic and topical analgesics.
 Consider immobilisation, if unstable – early mobilisation, if stable.
 Consider the use of aids, braces or devices.
 Consider immediate operative treatment if further deterioration is expected.
 Consider operative reconstruction of tendons, capsule and ligaments.
 Consider operative or non-operative stabilisation of fractures.
 Maintain physical fitness during the rehabilitation.
 Return to sport when pain free and able to carry out all skills required by the sport.
 Understand the mechanism of injury to prevent future injuries.
 Consider adaptation of special technique in sport.

Health gain RICE will limit the extent and the severity of the disease and operative or non-operative stabilisation might prevent further deterioration. Operative reconstruction will allow regain of function. Early mobilisation will prevent muscle weakness, contractures and complications (thrombosis, embolism). This will benefit most the individual in the early post-traumatic phase of a sports injury.

What resources are required?

The implementation of these recommendations will require resources for early assessment and management. This includes education of public, patients and health professionals of the benefits of early diagnosis and management; and the physical and professional resources to provide appropriate expert multi-disciplinary and multi-professional care.

4.11 Strategies for those with musculoskeletal problems

Strategy

To prevent the enormous impact on the quality of life of individuals and socio-economic impact on society related to musculoskeletal conditions, those with a musculoskeletal condition (who have pain, impairment of function, limitation of activities and restriction of participation) should have fair (considers equity, timeliness and ethics) opportunity of access to appropriate care which will reduce pain and the consequences of musculoskeletal conditions, with improvement in functioning, activities and participation. These outcomes should be achieved in the most cost effective way possible for the appropriate environment.

Interpretation

This requires that those who have musculoskeletal conditions have access to appropriate health and social care, and support in the home and workplace. There should be equity of access to care, which should have demonstrated benefit and appropriateness to meet their needs.

The following approaches are recommended for assessment and management to achieve the best outcomes. These are on a background of

- enabling people to know what to do, either managing the problem themselves or knowing when to seek expert help
- enabling people to access the skills necessary to manage and take responsibility for their own condition in the long term and to be able to lead full and independent lives.

Condition	Recommended management those with various established musculoskeletal conditions (established musculoskeletal condition strategy)
Osteoarthritis	<p>The strategies outlined for those at risk should be undertaken including education programs to encourage self management. These should include information on the condition, lifestyle and its treatment.</p> <p>There should be pain management including the use of topical analgesics, simple analgesics and anti-inflammatory analgesics (NSAIDs).</p> <p>The use of glucosamine sulphate, chondroitin sulphate or hyaluronic acid and of I/A therapies (including corticosteroids, hyaluronic acid and tidal irrigation) should be considered.</p> <p>Normal biomechanics should be restored, including osteotomy, ligament and meniscal surgery where indicated. Joint replacement surgery should be considered for end-stage joint damage that is causing unacceptable pain or limitation of function. Surgery should be timely.</p> <p>There should be rehabilitation programmes to improve function, activities and participation. The use of aids, braces or devices should be considered. Environmental adaptations in the home and workplace should be considered.</p>
Rheumatoid arthritis	<p>DMARD treatment should be continued in addition to symptomatic therapy and rehabilitative interventions.</p> <p>Treatment should be expertly monitored to ensure ideal disease control. The choice of treatment should take into account the presence of prognostic indicators supporting the use of more aggressive therapy.</p> <p>Surgery should be considered for end-stage joint damage that is causing unacceptable pain or limitation of function. Those with late stage rheumatoid arthritis may have greater surgical needs and a co-ordinated approach is required. Surgery should be timely.</p> <p>Treatment should consider all aspects of the effect of the condition on the person.</p> <p>There should be rehabilitation programmes and modification of the work, home and leisure environment to enable people with rheumatoid arthritis to participate as fully as possible.</p>

Back pain	<p>Effective treatments for subacute and chronic non-specific back pain are exercise therapy, behavioural therapy including pain management or a combination of these.</p> <p>Multi-disciplinary programs should be delivered for non-specific back pain if there is no improvement with exercise or behavioural therapy. It is as yet unclear what the optimal content of these programs is.</p> <p>Rehabilitation should be undertaken with consideration and involvement of the workplace.</p> <p>Back pain of known cause (<u>specific</u> back pain) needs specific management.</p>
Osteoporosis	<p>For those with established osteoporosis there are a number of key strategies that depend on the severity and stage of the disease. The appropriate strategy will consist of one or a combination of the following:</p> <ul style="list-style-type: none"> • education and lifestyle advice (as above) • analgesia when indicated • physiotherapy when indicated • pharmacological intervention with bone active drugs • falls prevention programme in older people at high risk of falling • calcium and vitamin D supplementation in frail older people • orthopaedic management of fracture when indicated • multi-disciplinary rehabilitation • nutritional support • hip protectors for frail older people in residential care or nursing homes
Major musculoskeletal injuries	<p>Pain management including systemic and topical analgesics.</p> <p>Consider definitive operative treatment, including stabilisation, reconstruction of biomechanics, arthroplasty, reattachment of limbs, amputation, and plastic surgery.</p> <p>Consider definitive non-operative treatment, including use of aids, braces or devices or prosthetic devices.</p> <p>Start early mobilisation and rehabilitation.</p> <p>Consider reintegration into work process and society.</p>
Occupational musculoskeletal injuries	<p>Pain management including systemic and topical analgesics.</p> <p>Partial work restriction.</p> <p>Consider the use of aids, braces or devices.</p> <p>Maintain physical fitness during the rehabilitation.</p> <p>Understand the mechanism of injury and prevent future injuries by considering modification of task and work organisation, transferring the patient to another job or distinct job modification.</p> <p>Return to work early.</p>
Sports injuries	<p>Pain management including systemic and topical analgesics.</p> <p>Consider in depth diagnosis, incl. MRI, diagnostic arthroscopy etc.</p> <p>Consider operative reconstruction of tendons, capsule and ligaments.</p> <p>Consider operative or non-operative stabilisation of fractures.</p> <p>Active rehabilitation with joint specific exercises.</p> <p>Maintain physical fitness during the rehabilitation process.</p> <p>Return to sport when pain free and able to carry out all skills required by the sport.</p> <p>Multi-disciplinary approach for the care of athletes should involve coach, physiotherapist, physician, physiologist, psychologist, nutritionist, podiatrist and biomechanics.</p> <p>Evaluate the mechanism of injury and training errors to prevent future injuries.</p> <p>Based on understanding the rules, the physiological stresses and the injury mechanism consider adaptation of training and technique.</p>

Justification

Such an approach will reduce the impact of these musculoskeletal conditions on people and societies. The timeliness of these interventions is important since most of these conditions are not reversible.

Strategies for the specific musculoskeletal conditions

OSTEOARTHRITIS – Strategy for the Population with Late or Severe Osteoarthritis	
How to identify	People with impairment and/or changes on X-rays
Interventions recommended	<p>The strategies outlined for those at risk should be undertaken including education programs to encourage self management. This should include information on the condition, lifestyle and its treatment.</p> <p>There should be pain management including the use of topical analgesics, simple analgesics and anti-inflammatory analgesics (NSAIDs).</p> <p>The use of glucosamine sulphate, chondroitin sulphate or hyaluronic acid should be considered.</p> <p>The use of I/A therapies including corticosteroids, hyaluronic acid and tidal irrigation should be considered.</p> <p>Abnormal biomechanics should be restored, including osteotomy, ligament and meniscal surgery where indicated. Joint replacement surgery should be considered for end-stage joint damage that is causing unacceptable pain or limitation of function. Surgery should be timely.</p> <p>There should be rehabilitation programmes to improve function, activities and participation. The use of aids, braces or devices should be considered.</p> <p>Environmental adaptations in the home and workplace should be considered.</p>
Health gain	<p>A decreased incidence and severity of degenerative joint disease and the individual patient will have a decrease in pain and stiffness, their mobility will improve and they will be more independent with a better quality of life. There will be a decreased incidence/severity of cardiovascular disease secondary to increased physical activity and decreased obesity. The most benefit will be for the individual patient who will have significant pain and disability as well as society as a whole. The benefits will be immediate from better pain control.</p>
RHEUMATOID ARTHRITIS – Strategy for the Population with Established and Late Stage Rheumatoid Arthritis	
How to identify	The population that has late stage rheumatoid arthritis (more than 3 months of disease) as defined by the ACR criteria
Interventions recommended	<p>DMARD treatment should be continued in addition to symptomatic therapy and rehabilitative interventions.</p> <p>Treatment should be expertly monitored to ensure ideal disease control. The choice of treatment should take into account the presence of prognostic indicators supporting the use of more aggressive therapy.</p> <p>Surgery should be considered for end-stage joint damage that is causing unacceptable pain or limitation of function. Those with late stage rheumatoid arthritis may have greater surgical needs and a co-ordinated approach is required. Surgery should be timely.</p> <p>Treatment should consider all aspects of the effect of the condition on the person.</p> <p>There should be rehabilitation programmes and modification of the work, home and leisure environment to enable people with rheumatoid arthritis to participate as fully as possible.</p>
Health gain	<p>A reduction in structural damage, better pain control, maintained independence and back to work. Those with established rheumatoid arthritis, in particular those with poor prognostic indicators will benefit most and this will be from the initiation of effective management.</p>

BACK PAIN – Strategy for the Population with Chronic Back pain

How to identify	The population that has non-specific low back pain, that lasts more than twelve weeks
Interventions recommended	<p>Effective treatments for subacute and chronic non-specific back pain are exercise therapy, behavioural therapy including pain management or a combination of these.</p> <p>Multi-disciplinary programs should be delivered for non-specific back pain if there is no improvement with exercise or behavioural therapy. It is yet unclear what the optimal content of these programs is.</p> <p>Rehabilitation should be undertaken with consideration and involvement of the workplace.</p> <p>Back pain of known cause (<u>specific</u> back pain) needs specific management.</p>
Health gain	A reduction in symptomatology and less limitation of activities. Those out of work or restricted due to chronic back pain will benefit most and this will from the first year of such a strategy.

OSTEOPOROSIS – Strategy for the Population with Established Osteoporosis

How to identify	Men and women with one or more fragility fracture \pm BMD T score \leq -2.5
Interventions recommended	<p>For those with established osteoporosis there are a number of key strategies that depend on the severity and stage of the disease. The appropriate strategy will consist of one or a combination of the following:</p> <ul style="list-style-type: none"> • education • lifestyle advice (as above) • analgesia when indicated • physiotherapy when indicated • pharmacological intervention with bone active drugs • falls prevention programme in older people at high risk of falling • calcium and vitamin D supplementation in frail older people • orthopaedic management of fracture when indicated • multi-disciplinary rehabilitation • nutritional support • hip protectors for frail older people in residential care or nursing homes
Health gain	<p>A reduction in age-related bone loss, fracture risk, symptoms and improved function, mobility and independence. A reduction of mortality after fracture. There will be multiple benefits associated with avoidance of tobacco and alcohol abuse.</p> <p>Drug-related side-effects may occur with all pharmacological interventions, for example bisphosphonates may be associated with gastrointestinal side-effects, non-steroidal anti-inflammatory drugs may be associated with gastrointestinal side-effects and codeine and opiate analgesics may be associated with constipation and confusion, especially in the elderly. If HRT is used, improvement in menopausal symptoms if present and reduction in colon cancer and increased risk of breast cancer, thromboembolic disease and cardiovascular disease. If raloxifene used, reduction in breast cancer risk.</p> <p>Benefit will be for all this target population identified by previous history of fragility fracture will benefit. Vertebral fractures may be asymptomatic and require spine X-rays for accurate diagnosis.</p> <p>Benefit occurs from the earliest stages with good fracture management, pain management and rehabilitation. Reduced fracture risk is from 1-2 years and is longterm provided that interventions are maintained.</p> <p>Treatment with some antiresorptive agents is cost effective in postmenopausal women with established osteoporosis and in women with osteoporosis aged 70 years and older. Treatment may be cost effective in younger postmenopausal women, depending on fracture probability.</p>

MAJOR MUSCULOSKELETAL INJURIES - Strategy for the Population with the Late Phase of Trauma

How to identify	Those suffering from severe musculoskeletal injuries in the late phase
Interventions recommended	<p>Pain management including systemic and topical analgesics</p> <p>Consider definitive operative treatment, including:</p> <ul style="list-style-type: none"> • stabilisation • reconstruction of biomechanics • arthroplasty • reattachment of limbs • amputation • plastic surgery <p>Consider definitive non-operative treatment, including:</p> <ul style="list-style-type: none"> • use of aids, braces or devices • prosthetic devices <p>Start early mobilisation and rehabilitation.</p> <p>Consider reintegration into work process and society.</p>
Health gain	A reduction in mortality and morbidity of patients with major injuries, with a reduction in pain and functional limitation and improved mobility, activities and participation, especially in work and society. The individual with advanced major musculoskeletal injury will benefit most.

Occupational Injuries: Strategy for the population with the late phase of trauma

How to identify	Those with impairments in relation to their work environment and work performance
Interventions recommended	<p>Pain management including systemic and topical analgesics.</p> <p>Partial work restriction.</p> <p>Consider the use of aids, braces or devices.</p> <p>Maintain physical fitness during the rehabilitation.</p> <p>Understand the mechanism of injury.</p> <p>Prevent future injuries by:</p> <ul style="list-style-type: none"> • considering modification of task and work organisation • transferring the patient to another job • distinct job modification <p>Return to work early.</p>
Health gain	A decrease in pain and improved activity and participation with a decrease in number of days absent from work and early retirements. This will most benefit the individual with an advanced stage of work-related disorders

Sports Injuries: Strategy for the population with the late phase of trauma

How to identify	Those in the late post-traumatic phase
Interventions recommended	<p>Pain management including systemic and topical analgesics.</p> <p>Consider in depth diagnosis, including MRI, diagnostic arthroscopy etc.</p>

Consider operative reconstruction of tendons, capsule and ligaments.

Consider operative or non-operative stabilisation of fractures.

Active rehabilitation with joint specific exercises.

Maintain physical fitness during the rehabilitation process.

Return to sport when pain free and able to carry out all skills required by the sport.

Multi-disciplinary approach for the care of athletes should involve coach, physiotherapist, physician, physiologist, psychologist, nutritionist, podiatrist and biomechanics.

Evaluate the mechanism of injury and training errors to prevent future injuries.

Based on understanding the rules, the physiological stresses and the injury mechanism consider adaptation of training and technique.

Health gain Operative or non-operative stabilisation might prevent further deterioration and operative reconstruction will allow to regain functional improvement. Early rehabilitation will prevent muscle weakness, contractures and complications (thrombosis, embolism). Appropriate and early treatment will allow to return early back to sport. This will most benefit the individual in the late post-traumatic phase.

Other strategies appropriate for all those with musculoskeletal conditions

A partnership approach to treatment

A 2003 EULAR guideline on treatment states that ‘there is no single right or wrong approach, and each health professional must decide with each patient the most appropriate management plan at that particular time’. There is an increasing trend towards treatment options being considered jointly and for the patient to play an active and willing role in the management of their condition. This is frequently described as ‘concordance’, a concept which describes a relationship of roughly equal power between health professional and patient. Previous notions of ‘compliance’ related to the notion of an authoritative practitioner issuing instructions for the patient to obey, which in the management of long term conditions in particular is unlikely to empower patients to take control of their lives. Indeed, around half of all patients with a chronic condition do not take their medicines as prescribed (7) so the Strategies recommended in this document encourage patient and professional to find a shared approach to treatment, in line with the EULAR guideline cited.

Disability rights

At every level, account needs to be taken of a growing sense of civil and human rights, especially the right not to be discriminated against on the basis of disability. An increasing number of member states have developed anti-discrimination legislation (e.g. the Disability Discrimination Act 1995.UK) and the call for an EU directive on non-discrimination specific to disability is gathering support. By 2007 member states will also need to have in place anti-discrimination measures securing the rights of older people.

Ageing population

Considering the ageing population across Europe and the exponential relationship between age and the development of musculoskeletal conditions, policymakers and professionals should prepare now for the predictable rise in demand for health and social care services, accompanied by higher expectations enshrined in law.

Social model of disability

Disability is no longer conceived of as a medical issue but as a relationship between the individual with an impairment and their environment. For people with a musculoskeletal condition, some of the adaptations that support independent living are personal, such as braces. There is evidence to support this and the Strategies document has made some of its recommendations on this basis. Others are less directly personal, such as assistive devices; and many are environmental eg housing adaptations. Speedy access to assessments regarding daily living is essential if conditions are not to be allowed to deteriorate for the lack, for example, of a stairlift at home or a workplace adjustment. Personal and vocational rehabilitation should be available as soon as it becomes necessary, otherwise needs may become more complex and, correspondingly, more expensive.

Transport

A vital link in the chain for people with a musculoskeletal condition at any stage is transport. A recent survey by the Disabled Persons Transport Advisory Committee (DPTAC) showed that ‘for nearly half of disabled people (48%) transport is the most important local concern but only a fifth (21%) believe those responsible for transport planning and development give about

the right amount of attention to disabled people' (Attitudes of Disabled People to Public Transport in England and Wales', DPTAC).

Employment

EU employment initiatives seeking to support disabled people in the labour market require fully accessible public transport for all citizens. Without this, the skills of potential employees may be lost to the labour market and the impact of national 'welfare to work policies' may be inadvertently undermined. People with musculoskeletal conditions may lose independence and instead experience isolation, frequently cited as a major factor in the onset of depression. In particular, the provision of timely vocational or occupational rehabilitation can make the difference between retaining or losing the skills of an individual to the labour market. The same sort of flexible support – in accordance with the fluctuating nature of most musculoskeletal conditions – is important in education and training too. Barriers to employment in later life may already have been erected during youth where lack of support can lead to a paucity of qualifications among disabled people.

Multiple disadvantage

People who develop a musculoskeletal condition may experience additional barriers to participation if they face other inequalities of opportunity. For example, somebody living in a remote area may have great difficulty accessing appropriate support; or someone from a minority ethnic background may face barriers to support centred around discriminatory attitudes or cultural insensitivity of services. It is recommended that public health and wider social initiatives targeting 'disadvantaged' or 'harder to reach' groups should ensure that the needs of people with musculoskeletal conditions are taken into account positively and explicitly. This disease area already carries with it elements of stigma (eg associations with deformity, old age, inevitability, 'greyness') which policymakers need to combat if the combined burden on states and individuals is to be tackled effectively.

Patient education

A critical tool for people with musculoskeletal conditions to manage their condition effectively is access to high quality information. For many, this is the basis on which to make many of their decisions about treatment, in conjunction with their practitioner/s. There is growing evidence to demonstrate improved outcomes as a result. One study suggested that patient education was around 20% as effective as NSAIDS and had a synergistic effect with other treatments (8). The role of patient or 'user' groups is important here as the source of the information is important – greater credibility is attached to information which is perceived as being neutral, non-prescriptive and unbiased.

Self-management

The work of Kate Lorig at Stanford Research Institute pioneered an approach to self-management which has shown one result to be fewer visits to primary practitioners from course participants. These courses cover areas which are important to people with musculoskeletal conditions – such as diet, exercise, pacing oneself and adopting a positive attitude to living with the condition – but which health professionals rarely have the time to explore in detail. Several governments in Europe are seeking to include this approach in their national health services. In the UK, for example, where Arthritis Care introduced and promoted self-management, the government has introduced its own Expert Patients programme which now reaches thousands of people a year.

What resources are required?

The implementation of these recommendations for those with established musculoskeletal conditions require resources for appropriate management and also for support in the home, community and workplace. This includes health and social care as well as support in the workplace. An integrated multi-disciplinary and multi-professional approach to the management of chronic musculoskeletal conditions is central to achieving the best outcomes.

4.12 What do we need to know?

The strategies that have been outlined indicate that there is a strong evidence base for action that can and should be taken for the prevention and management of musculoskeletal conditions. However there are many gaps in our knowledge which have been identified. The most important is the lack of evidence of the effectiveness of integrated strategies such as those recommended to improve musculoskeletal health, although there is evidence for their effectiveness as individual interventions. In addition there is a lack of information about the potential cost effectiveness of these strategies to allow informed choices about their implementation at a local level.

Indicators need to be used, such as those recommended in the European Commission Report “Indicators for Monitoring Musculoskeletal Problems and Conditions”, to monitor whether the implementation of these strategies improve musculoskeletal health. In addition, user-centred outcome should be used to enable targeting and monitoring of care. These indicators not only consider the direct effects on health of musculoskeletal problems and conditions but also the impact due to effects on employment and social care. Health economic evaluations are needed of the strategies to enable choices to be made on the basis of cost effectiveness in the local settings they are to be implemented.

4.13 What are the implications of implementation of these strategies? What does this mean for different stakeholders?

The implementation of these strategies is the real challenge. There are actions needed at all levels: the European and national political level; the employer level; the health care and social care professional; the patient and carer level and the public as a whole. Firstly we need to consider the actions required to implement these strategies and secondly what this implies for these different stakeholders. In this way we can identify what needs to be done by whom to implement the recommended strategies for the whole population, for those at risk and for those with a musculoskeletal condition. Suggestions of such actions required to implement the recommended strategies are given in the following tables. These consider separately what needs to be done and then what can be done at the European and national political levels; the employer level; the health and social care professional level; the patient and carer level and finally by the public as a whole. The principles of implementing health-related strategies, in particular those related to musculoskeletal health, are fully considered in Part 5.

What actions are necessary for the implementation of recommended strategies

To prevent musculoskeletal problems and conditions where possible and to ensure that those people with musculoskeletal problems and conditions enjoy life with quality and independence, the following actions are recommended:

General

- ⇒ A comprehensive health strategy to address the determinants of musculoskeletal health should be developed at the European, national and local levels. This should consider health promotion, prevention, treatment and rehabilitation of musculoskeletal conditions based on the recommendations of this report.
- ⇒ It should be ensured that musculoskeletal conditions reach the political agenda at all levels, recognising the importance of musculoskeletal health and making appropriate priorities with resources.
- ⇒ Priority should be given at the European and national level to the research needs of musculoskeletal conditions. European and national research programmes should be developed that will lead to a better understanding of the causes of musculoskeletal conditions and their effects on people, more effective prevention and treatment and to recognise the need to evaluate the cost effectiveness of strategies for their prevention.
- ⇒ Programmes to prevent musculoskeletal problems and conditions should link with existing priorities and activities, such as around determinants of health, where there are opportunities for mutual benefit.
- ⇒ Data should be collected, for example as part of health interview surveys, to monitor determinants for, occurrence and impact of musculoskeletal conditions in all European states in a standardised manner. This will enable the quantification and monitoring of the scale of the problem and the effect of the implementation of any health strategies.

Strategies for the Whole Population

People at all ages should be encouraged to follow a healthy lifestyle and to avoid the specific risks related to musculoskeletal health. This means

- Physical activity to maintain physical fitness
- Maintaining an ideal weight
- A balanced diet that meets the recommended daily allowance for calcium and vitamin D
- The avoidance of smoking
- The balanced use of alcohol and avoidance of alcohol abuse
- The promotion of accident prevention programmes for the avoidance of musculoskeletal injuries
- Health promotion at the workplace and related to sports activities for the avoidance of abnormal and overuse of the musculoskeletal system
- Greater public and individual awareness of the problems that relate to the musculoskeletal system. Good quality information on what can be done to prevent or effectively manage the conditions and the need for early assessment.

What actions are required to enable implementation

- ⇒ The awareness of the public and of health professionals should be raised about the scale and impact of musculoskeletal conditions and of the options for prevention and treatment.
- ⇒ People at all ages should be empowered to be responsible for their own musculoskeletal health by access to information about a musculoskeletal healthy lifestyle supported through public health programmes, health promotion campaigns and healthy workplace programmes.
- ⇒ This requires actions by the whole community including policy makers, providers of health and social care, employers and the public

- ⇒ Health promotion initiatives should be harmonised and synergies explored where there are similar recommendations such as for cancer and cardiovascular disease.
 - ⇒ Data should be collected, e.g. in health interview surveys, to monitor determinants for, occurrence and impact of musculoskeletal conditions in all European states in a standardised manner. This will enable the quantification and monitoring of the scale of the problem and the effect of the implementation of any health strategies.
 - ⇒ Employment and disability legislation should be appropriate for the maintenance of musculoskeletal health.
 - ⇒ Safe communities should be created that reduce the risk of accidents and facilitate a musculoskeletal healthy lifestyle.
 - ⇒ Workplaces should be created that provide appropriate ergonomics, reduce risk of accidents and optimise psychological stress.
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Strategies for the At Risk Population

Those at greatest risk must be identified and encouraged to take measures to reduce their risk.

What actions are required to enable implementation

- ⇒ Case finding approaches should be implemented for the different musculoskeletal conditions aimed at identifying those individuals who are most at risk of future problems related to musculoskeletal diseases and who will benefit from evidence-based interventions. This should be through
 - Clinical guidelines that are accepted by peers
 - Provision of appropriate resources
 - Use of information systems
 - Ensuring competency of health care providers
 - ⇒ Actions should be taken across the community to reduce the risk factors for musculoskeletal conditions.
 - ⇒ People at all ages should be empowered to be responsible for their own musculoskeletal health and understand by access to information and education about their personal risks and of the actions they can take to reduce their risks through public health programmes, health promotion campaigns and healthy workplace programmes.
 - ⇒ Further research should be undertaken to better identify those at most risk of musculoskeletal conditions to enable more effective targeting of strategies for prevention
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Strategies for Those with a Musculoskeletal Condition

Those with earliest features of a musculoskeletal condition should receive an early and appropriate assessment of the cause of their problem. Once their needs have been identified they should receive early and appropriate management and educated in the importance of self-management.

Those with an established musculoskeletal condition (who have pain, impairment of function, limitation of activities and restriction of participation) should have fair (considers equity, timeliness and ethics) opportunity of access to appropriate care which will reduce pain and the consequences of musculoskeletal conditions. These outcomes should be achieved in the most cost effective way possible for the appropriate environment.

What actions are required to enable implementation

- ⇒ Those with any of the different musculoskeletal conditions, at any stage from the earliest features, should be assessed and managed by someone with the appropriate competency and have timely access to care that is appropriate to their needs (equity) through

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- Implementation of evidence based guidelines for early management with appropriate resources
 - Quality assurance mechanisms for guidelines and outcomes of care
 - Access to
 - education
 - symptom control
 - disease modifying therapy when indicated
 - rehabilitation
 - multi-professional and multi-disciplinary integrated approach to care as required
 - support to minimise impact on home, work and leisure activities
- ⇒ Timely access for those with the earliest features of a musculoskeletal condition is most important to minimise the associated morbidity.
- ⇒ People at all ages should be empowered to be responsible for their own musculoskeletal health by access to information and education to enable them to recognise the early features of a musculoskeletal condition and to know what to do, through both managing the problem themselves and knowing when to seek expert help.
- ⇒ The stigmas associated with musculoskeletal conditions should be reduced and a positive attitude created to facilitate early presentation to the healthcare system through education and raising awareness.
- ⇒ People with an established musculoskeletal condition should also be empowered to know what to do, through both managing the problem themselves and knowing when to seek expert help through information, education and training.
- ⇒ People should be enabled to access the skills necessary to take responsibility for their own musculoskeletal condition in the long term, make informed choices and to be able to lead full and independent lives through
- Access to high quality information so that people can develop and maintain an informed dialogue with health and social care professionals
 - Self management programmes / expert patient groups
- ⇒ People should be enabled to participate in home, work and leisure activities through environmental adaptation, provision of services and sickness benefit regulations.
- ⇒ People should be enabled to stay at work or in education by health care, social support, education and training, and employment policies, which are linked where appropriate. For example
- Flexible education and training arrangements
 - Flexible working arrangements
 - Flexible benefits and social support
- ⇒ There should be an integrated approach to those with musculoskeletal conditions between health and social care professionals.
- ⇒ There should be appropriate education and competency of health professionals to manage musculoskeletal conditions in an evidence-based way at all levels of health care provision.
-

4.12 What are the implications for the different stakeholders?

These actions have implications for what the different stakeholders need to do. Recommendations are given for each level:

European Political Level

- ⇒ Develop and implement European plans and policies that
 - recognise the importance of musculoskeletal health
 - encourage & facilitate the implementation of this strategy
 - explicitly refer to musculoskeletal conditions alongside existing priorities and activities for other disease areas where there is mutual benefit such as within public health policies and initiatives for common determinants of health.
 - give priority to the need for research and for programmes to be developed that will lead to a better understanding of the causes of musculoskeletal conditions and their effects on people, and secondly the need to evaluate the cost effectiveness of strategies for their prevention.
 - ⇒ Recognise political salience of reducing the burden of musculoskeletal conditions
 - ⇒ Initiate data collection, for example as part of health interview surveys, to monitor determinants for, occurrence and impact of musculoskeletal conditions in all European States in a standardised manner.
 - ⇒ Support cross-sectoral working and bring together policies of mutual benefit for musculoskeletal health eg bringing together health, social, education, transportation and housing policies.
 - ⇒ Develop policies to keep people at work despite their musculoskeletal condition.
 - ⇒ Encourage national implementation of guidelines for case-finding appropriate to local population.
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National Political Level

- ⇒ Develop and implement national and regional plans / policies that
 - recognise the importance of musculoskeletal health and give appropriate priority to the improvement of musculoskeletal health that is commensurate with the burden of these conditions.
 - encourage & facilitate the implementation of this strategy, recognising political opportunities and providing necessary resources.
 - explicitly refer to musculoskeletal conditions alongside existing priorities and activities for other disease areas where there is mutual benefit such as within public health policies and initiatives for common determinants of health.
 - give priority to the need for research and for programmes to be developed that will lead to a better understanding of the causes of musculoskeletal conditions and their effects on people, and secondly the need to evaluate the cost effectiveness of strategies for their prevention.
- ⇒ Initiate data collection, for example as part of health interview surveys, to monitor determinants for, occurrence and impact of musculoskeletal conditions in a standardised manner to other European States.
- ⇒ Provide public health programmes that implement the recommended strategies, including actions to reduce known risk factors.
- ⇒ Health and safety legislation appropriate to maintaining musculoskeletal health.
- ⇒ Support cross-sectoral working - bring together policies of mutual benefit eg bringing together health, social, education, employment, transportation and housing policies.

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- ⇒ Initiate development and implementation of guidelines for case-finding appropriate to local population and provision of resources and incentives for the implementation of these guidelines.
 - ⇒ Implement guidelines for early management of musculoskeletal conditions appropriate to the local population and provision of resources and incentives for the implementation of these guidelines.
 - ⇒ Ensure health systems provide timely access to care with equity of access for the various musculoskeletal conditions where early actions will alter outcomes.
 - ⇒ Develop quality assurance mechanisms for guidelines.
 - ⇒ Ensure competency of providers of care, including establishing standards for education and training of health and social care professionals.
 - ⇒ Develop and implement policies to keep people at work despite their musculoskeletal condition, such as flexible working arrangements, flexible benefits and appropriate social support.
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Employer Level

- ⇒ Create a good workplace that provides appropriate ergonomics, reduces the risk of accidents and minimises psychological stress.
 - ⇒ Provide access to appropriate lifestyle advice and offer workplace programmes to discourage smoking and provide healthy food.
 - ⇒ Offer opportunities to keep people in employment or to facilitate early return to employment through work adjustment or flexibility in working hours.
 - ⇒ Timely provision of vocational and professional rehabilitation.
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Health and Social Care Professional Level

- ⇒ Ensure all health and social professionals are aware of the need for and possibilities for prevention, and to promote them.
 - ⇒ Have an advocacy role, communicating the burden of disease to public, politicians and peers, and promoting strategies for their prevention and treatment.
 - ⇒ Develop a more integrated approach between health and social care professionals and identify mutual benefits across sectors.
 - ⇒ Ensure appropriate competency of health and social care professionals so that they are able to (a) recognise and advise those at risk and are (b) able to manage those with a musculoskeletal problem appropriate to their needs including recognising when they require timely and / or more expert management (triage).
 - ⇒ Prioritise resources into appropriate services to improve musculoskeletal health (financial, physical and human).
 - ⇒ Implement guidelines for management of musculoskeletal conditions at all stages appropriate to local population that include identification of those who need most rapid assessment and management.
 - ⇒ Provide integrated, co-ordinated, seamless, multi-professional, multi-disciplinary care.
 - ⇒ Establish quality assurance systems to ensure the best outcomes for those with musculoskeletal conditions.
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Patient / Carer Level

- ⇒ Recognise the patient / carer potential educational role to the community by engaging with other stakeholders and relating experience.
 - ⇒ Understand the concept of being a person at risk, take a responsibility to maintain your own musculoskeletal health and ensure that you have access to reliable and up-to-date information to minimise your risk of developing a musculoskeletal condition.
 - ⇒ Reduce the stigma associated with musculoskeletal conditions and create a positive attitude to facilitate early presentation to the healthcare system through education and raising awareness.
 - ⇒ Enable people to recognise the early features of a musculoskeletal conditions and to know what to do, either managing the problem themselves or knowing when to seek expert help.
 - ⇒ Enable people to access the skills necessary to manage and take responsibility for their condition in the long term and to be able to lead full and independent lives.
 - ⇒ Ensure access to high quality information so that people can develop and maintain an informed dialogue with health and social care professionals.
 - ⇒ Ensure access to early assessment and management, including access to self-management courses where available.
 - ⇒ Be aware of your rights and access to education, training and employment.
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Public Level

- ⇒ Raise children to actively participate in physical activities, have body awareness and maintain this throughout life through education, public awareness and health promotion.
 - ⇒ Take responsibility to maintain own musculoskeletal health.
 - ⇒ Be aware of the need for and possibilities for prevention of musculoskeletal problems and be able to make informed choices through education.
 - ⇒ Take steps to identify your individual risk and need for intervention by accessing information and other methods of risk assessment.
 - ⇒ Reduce the stigma associated with musculoskeletal conditions and encourage others in the community to take early action to reduce their risk.
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Part 5

The Implementation Of The Strategies

How to make it happen

- | | |
|-------------------------------|---|
| 5.1 Introduction | 5.5 Barriers to implementation |
| 5.2 Aims of this section | 5.6 Implementation of the Bone and Joint Strategies |
| 5.3 Implementation principles | |
| 5.4 Implementation tools | 5.7 Conclusion |

5.1. Introduction

“Writing a guideline may be difficult, but determining how best to implement the guideline is even more difficult” (1).

Despite the vast resources that have been invested in guideline development over the past decade there is now increasing evidence that implementation of guidelines and adherence to them in patient care is often low (2-4). In a survey of authors of musculoskeletal guidelines conducted as part of this project, over half of respondents did not know whether the guidelines had altered clinical outcomes and a third did not know whether it had changed clinical (1).

5.2 Aims of this section

The aim of implementation is to convert evidence based, cost effective strategies into health gain for the population and for the individual by translating strategic plans into action. The purpose of this section is to provide stakeholders with guidance on implementation processes at the national and local level that will help to change clinical practice, public behaviour and policy, drawing on examples from a spectrum of chronic and non-communicable diseases. It aims to identify the practical steps involved in taking the evidence-based strategies developed in Parts 3 and 4 and delivering them in practice.

The extensive literature on the diffusion (spread), adoption and use of innovations indicates that there are common factors that impede and facilitate implementation that apply to all health care services irrespective of how the system is financed or organised. There is also a growing body of evidence as to which strategies are more

practice. The effort devoted to identifying effective clinical practice has not been matched by attempts to ensure that such guidelines lead to changes in the process and outcome of care. As a result leaders in the guideline field have called for greater emphasis to be placed on implementation so that more effort is devoted to translating science into practice and to increasing our knowledge of clinically effective and cost effective implementation strategies

effective in implementing guidelines as summarised in the systematic review of systematic reviews on the topic conducted by the Cochrane Effective Practice and Organisation of Care Review Group (5). It should, however, be noted that the reviewers cautioned that the generalisability of current studies remains uncertain due to our limited understanding of the contextual, organizational, individual and behavioural factors that may influence the effectiveness of different interventions (6). The various social and behavioural, psychological, educational, organisational, epidemiological and marketing theories of change which underpin these interventions have not been specified but see Grol 1997(7), Granados 1997(8), Moulding 1999(9) for useful reviews of this literature. The findings of these reviews together with the experience of experts in the musculoskeletal field have informed the guidance offered in this implementation section.

5.3 Implementation Principles

Initiatives that seek to improve musculoskeletal health by the implementation of the musculoskeletal strategies recommended in this report are more likely to be effective if they adhere to the following principles:

Table 5.1 Principles of implementation

Principles of implementation
<ul style="list-style-type: none"> • Dissemination of this report’s recommendations should be planned, targeted and evaluated • Dissemination needs to be supplemented by active implementation strategies • Identify local, regional, national and /or international champions for change • Establish a task group to develop an implementation plan to change policies and / or clinical practice • Set clear and specific objectives that relate to your particular needs and priorities • Provide a rationale for action • Identify decision makers and their stage of readiness to change • Adopt a multifaceted approach to achieving change • Identify opportunities for integration with existing programmes • Think big but start small with strategies that are likely to have positive results • Evaluate for cost and clinical effectiveness

Dissemination should be planned, targeted and evaluated

The objective of dissemination is to increase awareness of the recommendations of this report, it will not in itself necessarily change behaviour. The expanding body of research and guidelines makes it difficult for any clinician to be aware of every applicable guideline and to critically apply it to practice (10). A dissemination plan must identify the key audiences who need to be informed of the strategies and, in each case, the methods to be used to reach them. These audiences are your key stakeholders either because they are directly affected by musculoskeletal problems as patients or carers, or because their

involvement is required for successful implementation of the strategies. Stakeholders differ in terms of what information they want to receive and how they want to receive it. Providing decision makers with information in the right format in the right setting will increase their awareness of and improve uptake of guidance. It should be noted that electronic and web-based dissemination are increasingly the sole means of disseminating information to physicians. Table 5.2 identifies potential dissemination media, table 5.3 the potential key audiences.

Table 5.2 Dissemination media

Dissemination Media
<ul style="list-style-type: none"> • Policy documents • Briefing papers • Reports • Journal articles • Conference papers • Practice protocols • Practice summaries • Patient guides • Workshop presentations • Newsletters • Press releases • Articles in the press • Face-to-face meetings • Radio/TV interviews • Emails • CD-ROMs • Internet sites

Table 5.3 Potential audiences

Potential Audiences
<ul style="list-style-type: none"> • General public: the mass media • Patients, families and carers • Patient groups/associations • Employers • Employee organisations • Health care providers: general practitioners, specialists, physiotherapists, nurses etc. • Pharmacists • Pharmaceutical and equipment suppliers • Social and community care providers • Local, regional and national health and social professional bodies • Health care purchasers/payers: insurance funds, health plans, service commissioners • Health and social policy makers: politicians in local, regional and national government

Dissemination needs to be supplemented by active implementation strategies

Implementation requires intensive efforts which include both dissemination activities to promote awareness of the report's recommendations and specific actions that seek to both reduce barriers to change and to promote desired outcomes (8). The poor adherence to clinical guidelines shows that passive diffusion and dissemination of information alone are insufficient to achieve change (11); some kind of motivation is required for any change to take place. Hobbs and Erhardt (2002) found that despite the wide dissemination of the revised European Joint

Societies' Task Force guidelines on coronary heart disease prevention, only 15% of primary care physicians reported their use (12). Stakeholders that wish to implement these strategies should produce a dissemination plan and an implementation plan that includes specific interventions that aim to change practice. The key elements of an implementation plan are detailed in table 5.7. Table 5.4 below identifies the components of a dissemination plan.

Table 5.4. Dissemination plan

Dissemination Plan
<ul style="list-style-type: none"> • Identify the key audiences who need to be informed of the report's recommendations • Establish what information they need to receive • Decide in what format this information should be provided • Determine the most effective media for ensuring that this information reaches them • Decide when would be an appropriate time to disseminate the information – this should consider budget cycles, political timetables, staff rotations etc. • Decide if dissemination needs to be phased to allow key decision-makers and potential champions for change to be provided with information in advance of other stakeholders • Determine how you can monitor dissemination processes and how you plan to evaluate the effectiveness of dissemination before you commence active distribution of information.

Identify 'champions for change'

Change in policy and practice at both the national and local level will not occur unless there are champions who take the lead in seeking to achieve change, establishing implementation task groups, coordinating dissemination and implementation plans and maintaining pressure to ensure that action happens (13). In the UK at the national level disease specific "czars" have been appointed to ensure implementation of guidance on the prevention and treatment of the most common health problems such as cancer and coronary heart disease. At the local level "clinical leads" in particular disease areas have been identified to coordinate implementation. Irrespective of whether such champions are individuals, voluntary organisations, or professional associations, they need to be credible and legitimate so far as other key stakeholders are concerned. Commonly they act as knowledge brokers, bridging the worlds of guidelines, policy and practice.

In Sweden such knowledge brokers have been successfully used by the SBU, the Swedish Council on Technology

Assessment in Health Care (www.sbu.se), which has recently published guidance on "Osteoporosis – prevention, diagnostics and treatment". Unlike many health technology assessment agencies SBU does not rely on passive dissemination of report alone, but also employs more than 30 health care professionals as 'ambassadors'. These ambassadors, travel around the country discussing with colleagues the SBU's findings as well as other material. Using one's peers to convey messages through face-to-face meetings is intended to increase the likelihood of uptake of messages. Recent research undertaken by SBU suggests that much of their guidance has been adopted, leading to benefits also in terms of improved prescribing patterns and health care resource use. Much of the success in uptake has been attributed to the Ambassador Programme.

Establish a task group to develop an implementation plan

A concrete proposal for changing policy and / or practice either locally or nationally should be developed before implementing activities are initiated. The various stakeholders affected by the strategies to be implemented should be involved in developing the implementation plan. At the national level this would include representatives from various stakeholder groups such as physician, nurse, and patient associations, health care planners and payers etc. Locally, it is essential to involve front line health and social care providers who will help to identify how the guidelines can be implemented in their particular health or social care setting. Such local adaptation can promote ownership of the recommendations and ensure that they are feasible for the local clinical setting and have considered the culture of the organisation and the potential positive

and negative impact of changing practice (14). In California the State Health Department and the Southern Chapter of the Arthritis Foundation are working together to disseminate a Spanish language version of an Arthritis Self-Help Course. Hispanic people participating in the course have reported improvements in their general health, sleep, depression, and activities of daily living.

The first step for such task groups is to conduct a ‘diagnostic analysis’ (15) of the local or national situation which will determine what interventions will be most effective in changing practice. The diagnostic analysis forms the basis of the implementation plan, for details see table 5.5.

Table 5.5 Diagnostic analysis of the context for change

Diagnostic Analysis of the Context for Change
<ul style="list-style-type: none"> • Who are the key stakeholders who are interested and need to be involved in implementation? Ensure their representation on the implementation task group . • Which aspects of care should be addressed? The team may seek to implement the strategies comprehensively or to focus on particular priorities which will have the greatest impact on outcomes or where existing practice diverges most from recommendations. • Which stakeholders (patients/providers/managers) will be most affected by the changes? • Precisely define what performance is desired and how it will be measured. • What are the problems, provider and systems features, organisational culture and climate that constrain change? • Identify implementation interventions that address these specific barriers to change. • Identify time frames, responsibilities and targets for the process of implementation. • Specify how progress against the implementation plan is to be monitored and evaluated and how its results will feed into subsequent implementation efforts.

Set clear and specific objectives

The key targets for implementation, in terms of changing political priority, clinical practice, or public behaviour will vary from country to country. Once the setting specific priorities have been identified, a few very specific objectives should be set and these should be repeatedly clarified to prevent a loss of focus. The objectives should be clearly communicated to all stakeholders and those affected by the proposed changes. These objectives should clearly relate to improving the health outcomes and quality of life of patients with or at high risk of musculoskeletal disease, or in the case of primary prevention seek to reduce the future burden of disease. The strategies in Part 4

identify the key objectives to improving bone and joint health. It is important to identify the local needs and priorities of your particular setting as they will determine which of these strategies need to be implemented. If, for example, your area has a particularly high rate of morbidity associated with rheumatoid arthritis one objective will be to ensure that all primary care physicians refer all patients with 3 or more persistently inflamed joints to a specialist as soon as possible for early diagnosis. The required change in practice can be achieved by an educational programme and revising referral procedures.

Provide a rationale for action

Health care professionals and managers are fundamentally well motivated to improve services but require support and sometimes pressure to initiate changes to practice. Similarly policy makers have to manage competing priorities across a broad agenda; their attention needs to be drawn to the problem of musculoskeletal health and reasons provided for why they should engage with it.

Providing evidence of the burden of the disease and evidence based guidance that can reduce this burden is not enough to achieve change, especially if providers perceive the recommendations to be too difficult or time consuming to integrate into their daily practice, where their clinical experience and the needs and preferences of patients, often with multiple illnesses, also need to be considered (12).

Identify decision makers' stage of readiness to change

Change can be understood as a continual process involving a number of stages: pre-contemplation, contemplation, preparation, action and maintenance (16). The first two stages involve changing knowledge and attitudes towards the recommendations. Moving to preparation and action involves changes in emotional processes, creating positive beliefs about the ability to undertake the change and the development of necessary skills. Maintenance involves restructuring the environment in which the behaviour

Link interventions to barriers to change

Identifying the specific competency-based, social and organisational barriers to implementing change and targeting specific interventions to address them will increase the effectiveness of the implementation plan. In Norway a lack of resources has been identified as a barrier to increasing the use of the Green Prescription scheme. A green prescription is a general practitioner's written advice to a patient to be physically active as part of the patient's health management, instead of providing oral advice alone. Green prescriptions encourage general practitioners and the community to work together and involve: general practitioners; community health visitors and nurses;

Adopt a multifaceted approach to achieving change

Given the complex process of change and the multiple barriers that may constrain it, multifaceted interventions which involve using a combination of implementation tools are more likely to be successful than a single intervention (1;14). This approach recognises that changing the attitude and behaviour of clinicians and policy makers cannot be achieved without consideration of the impact of external factors that may constrain their desire and ability to change practice. Systems thinking and quality improvement

Identifying the interests of particular stakeholders and specifying the benefits of action on musculoskeletal health in line with their particular concerns will help target groups to see the relevance of the guidance and may help to persuade them to engage with it. For example, for hospital managers concerned with waiting times, change could be identified as an opportunity to improve patient flow; changes aimed at primary care clinicians could show how by incorporating evidence into routine consultations it will reduce unnecessary follow-up appointments; employer and employee organisations may fund an educational programme to reduce work related back pain if it will reduce absenteeism.

occurs and providing social support and reward systems. Different change strategies are needed depending on where individuals are situated along this process (9). For example some health and social care providers may be positive about changing practice and have the skills to do so but are constrained by lack of resources, others may not yet be convinced of the need to change practice or may not recognise their educational needs.

patients and their families; and activity providers. Previous studies in New Zealand demonstrated that GPs use green prescriptions because they believed these to improve the health of their patients, which is consistent with some international studies. In order to increase the use of green prescriptions in Norway, financial incentives are being used in a pilot scheme; physicians are paid an additional fee for writing these prescriptions.

The barriers to change and potential interventions that address them are explored in more detail in section 5.4 and 5.5.

approaches now favour targeting interventions that change the behaviour of systems in order to achieve change in practice (17). This means that at the local level the implementation plan may need to specify different interventions aimed at providers, patients and managers. The Orthopaedic Services Collaborative in the UK have used this approach to improve discharge procedures and to reduce

the length of stay for patients after total hip replacement surgery (18).

A recent study from Germany provides a good example of the need for a multi faceted approach to community based health promotion. This particular study aimed to improve the early detection and management of people with depression compared with another region of Germany.

The programme has four levels of intervention.

- Primary care doctors were provided with training on diagnosis and management of depression, a series of workshops, a video with information and access to a specialist telephone advice line.
- Educational workshops and materials were also provided for other stakeholder groups: teachers, counselling centres, the clergy, telephone support line personnel, psychotherapists, the police and pharmacists.

- Individuals and their families were provided with a video on the condition, attempts were made to help organise self-help groups, and access to specialist help was provided. Consultation with the media on the way in which depression was reported also took place to try and reduce stigmatisation.
- A range of activities were undertaken to promote general awareness about the condition, symptoms and treatment for the general public. This included presentations to politicians, extensive publicity campaign with 25,000 brochures and 100,000 leaflets distributed. Poster and cinema advertising campaigns were also run.

At one year follow up the programme appeared to be effective, as the number of suicides and suicide attempts had fallen by 20% compared with the control region. A cost effectiveness analysis has yet to be undertaken.

Identify opportunities for integration with existing programmes

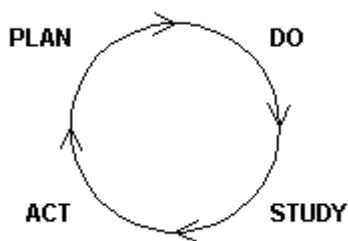
Resources and capacity for changing policy and practice will always be limited. Wherever possible identify existing initiatives that seek to promote health and to improve the quality and standards of care, such as the WHO CINDI programme, and seek to incorporate action on

musculoskeletal health under their umbrella. Those involved in such programmes are likely to be receptive to implementation proposals if they clearly identify how they can contribute to such initiatives, rather than duplicating or competing with them.

Start small with strategies that are likely to have visible results

Having developed the implementation plan, test to see if the changes will lead to measurable improvement. Quality improvement approaches recommend conducting a series of Plan-Do-Study-Act (PDSA) cycles to test and refine change ideas, in the process identifying unforeseen barriers and confirming whether a change proposal is realistic (19).

These small scale tests, involving motivated service providers, are important in building support for facility-wide adoption and in convincing sceptics of the benefits to be gained from change. Starting with strategies that are likely to have visible early results will encourage wider adoption, success breeding success.



- PLAN** – plan the change to be tested or implemented
- DO** – carry out the test or change
- STUDY** – study data before and after the change and reflect on what was learned
- ACT** – plan the next change cycle or plan implementation

Small scale tests are also useful in identifying the potential costs of change. The costs of implementing change and the expected and unexpected costs incurred as a result of changing practice should be carefully monitored to assess the overall cost effectiveness of recommendations. A

Health Centre in the UK applied the PDSA method to assess follow-up care given to reduce blood pressure in patients who had suffered a heart attack. At the start of the PDSA cycle only 40% of CHD patients had a blood

pressure of 140/80 mmHg or lower, after the cycle the

figure rose to 65% (20).

Evaluate for cost and clinical effectiveness

A programme of evaluation should be included as part of the implementation plan. The purpose of an evaluation will be to:

- monitor the process of implementation
- evaluate the impact of the strategy on health outcomes
- estimate the cost effectiveness of the implementation programme
- illuminate factors associated with the success or failure of implementation

Both process and outcome measures can provide valuable information on the effectiveness of implementation strategies. Process measures include changes in awareness, beliefs, practices, policy and productivity. The implementation team will need to translate key recommendations into indicators of adherence in order to monitor their implementation by health and social care providers (15). Such indicators typically measure whether processes of care have been changed to conform to recommendations. Outcome measures assess change in

health status, patient satisfaction, cost effectiveness, changes in demands on services and any side effects on other services. Implementation requires resourcing and so the implementation plan should clearly identify the likely costs in terms of staff time, materials, payment of locums etc for any subsequent cost effectiveness analysis.

When multifaceted approaches are being used it is important to remember that the synergy of multiple approaches is part of the intervention and so components should not be tested separately (17)}. Evaluation should lead to improvement and decisions as to whether to retain, change or reject innovations, adjusting the implementation plan accordingly. It should measure both expected change and identify unanticipated effects. Non-experimental evaluations can be used at the policy and public level to assess the impact of dissemination and implementation activities. These include observation studies such as case studies of demonstration projects and surveys of changes in awareness, behaviour, content analysis of media coverage and policy initiatives.

5.4 Implementation Tools

The range of interventions that can be used to achieve change can be classified as follows:

Educational Interventions

These address barriers related to public and providers' knowledge and attitudes that affect their behaviour.

For professionals

Educational materials; educational outreach; audit and feedback; reminders; interactive educational meetings; local opinion leaders; local consensus process; didactic educational meetings

For the public

Health education initiatives, patient mediated interventions; media campaigns e.g. establishing links with and providing high quality information to health journalists to raise awareness of the action

that individuals can take to reduce their risk of musculoskeletal disease.

Organisational Interventions

System wide changes to health and social care practices which address the organisational and structural obstacles to change.

Service redesign; adaptation of care pathways; changes to referral and discharge procedures; the involvement of other providers in care processes: nurse practitioners, pharmacists etc.

Regulatory Interventions

Government guidance, recommendations and policies; Government initiatives, legislation

Financial Interventions

Incentive schemes; changes in reimbursement fees; ring-fenced or protected budgets; contracts between payers and providers

The effectiveness of interventions aimed at changing clinical practice

Recent reviews (6;11;21;22) of over 1000 studies have investigated the effectiveness of various educational interventions aimed at professionals and have classified them as:

1. Consistently effective
2. Variable effectiveness
3. Little or no effect

The findings of these reviews are summarised in table 5.6. They are all more effective if done in combination. In

contrast, the evidence of the effectiveness of other interventions is sparse. The failure to achieve change in clinical behaviour by educational interventions points to the need to use organisational interventions to address barriers in the system of care. Financial incentives and regulatory initiatives are known to promote changes in practice, the more pertinent question is how to place musculoskeletal health high enough on the policy agenda that it results in policy initiatives and financial support.

Table 5.6 The effectiveness of educational interventions

The effectiveness of educational interventions	
Consistently Effective	Educational outreach visits Reminders Interactive educational meetings
Variable effectiveness	Audit and feedback Local opinion leaders Local consensus process Patient mediated interventions Multifaceted interventions involving educational outreach
Little or no effect	Educational materials Didactic educational meetings

The effectiveness of interventions aimed at changing national/regional policy

Theoretical frameworks of policy formation and implementation together with experience of policy development suggest that the following practices can help to place an issue higher up the policy agenda:

- Understand the processes involved in policy development in order to identify lobbying opportunities
- Develop relationships with decision makers and those who advise them
- Personal contact with staff is more effective than printed materials
- Identify concurrent policy issues that action on musculoskeletal health can link into
- Timing is key. Plan dissemination and lobbying activities to fit with policy and budget planning cycles.
- Work in partnership with professional and patient organisations
- Use the mass media to generate political interest and to create popular interest in addressing this issue
- Produce policy briefings that are short and written from the perspective of policy makers. They should address their key information needs:
 - What is the issue

- Why is it a problem that requires political attention
- What is present practice
- What are the options for change
- Which option will make the most significant difference soonest
- What is recommended and by whom
- The presentation should be clear and compelling and from an authoritative source
- Be persistent. Maintain communication with policymakers, keep them informed of developments in the field, and ensure they are aware of opportunities for them to obtain political capital by supporting action on musculoskeletal health. Knowledge transfer is a continual process and requires reinforcement.

The case study of the development of Denmark's national strategy on musculoskeletal disease on page 194 illustrates the importance of these factors in achieving

policy change and the need for longterm and sustained efforts to achieve change.

The effectiveness of interventions at changing public behaviour

Theories grounded in health and social psychology suggest that attitudes and beliefs are important predictors of intention and behaviour. Although there may be significant barriers to changing public behaviour, social marketing techniques can be used to promote awareness of health issues and to encourage shifts in attitude and behaviour. In seeking to change public behaviour it is important to work in partnership with other agencies and community organisations due to the influence of environmental, social and economic factors on health and health related behaviour:

- Identify groups within the population that are more or less likely to respond to messages, give greatest priority to those that will achieve greatest health gain.
- Use market research to identify target groups' current knowledge, attitudes and behaviour. Tailor messages and choice of communication media to the needs, interests and attitudes of the target groups.
- Ensure that the source of any information has credibility in the eyes of the target audience.
- should be considered.

Appropriate celebrities that the target group identifies with can help raise awareness and encourage action.

- Information should clearly provide a rationale for action, the action that needs to be taken, and the benefits to be gained.
- Information should be provided in a culturally sensitive format with verbal communication supported by written material.
- Identify the barriers that may constrain the target groups from taking action, such as problems in accessing health and social care by public transport – public information needs to address them explicitly.
- Identify other agencies who are in contact with the target groups and who could influence the social and economic determinants of health, e.g. housing agencies, social services, voluntary organisations and community groups.
- The timing and setting of information provision

5.5 Barriers to implementation

Successful implementation requires recognition and appropriate management of potential barriers that may impede change. In the case of multinational initiatives these barriers are often related to differences in structural, political, cultural and social characteristics and it is a particular challenge to anticipate and, where possible, overcome these potential difficulties. However, studies

indicate that many barriers are common to health care systems irrespective of their structure of financing and provision of services. In the following sections specific factors relevant to the Bone & Joint Strategies are considered as well as common obstacles to achieving change.

Barriers to multinational initiatives in Europe

Availability of appropriate services and resources

The resources available for health care and the manner in which they are raised and utilised vary significantly between European member states. This has effects on clinical resources and both diagnostic and therapeutic facilities; in addition, there are sometimes differences between countries in the availability of licensed treatments. Thus recommendations may not be universally applicable between member states and the benefits to individuals may

vary accordingly. Lack of resources available for guideline implementation was identified as a major barrier in a survey of authors of musculoskeletal guidelines. Optimal use of services and resources also requires the availability of adequately trained specialists and in this respect education and training for health professionals at all levels is highly relevant. In the absence of appropriate medical expertise, the presence of diagnostic or therapeutic resources may not benefit the individual and could potentially be harmful.

Health funding systems

Health funding structures also affect the ability to deliver recommendations to individuals. In many countries reimbursement policies are a significant barrier to the full implementation of recommendations. For example, although there is a strong consensus amongst experts on indications for bone densitometry to diagnose osteoporosis, which is reflected in national guidelines, not all individuals fulfilling these criteria are eligible for reimbursement. Furthermore, national prescribing policies, such as those recommended by the National Institute of Clinical Excellence in England and Wales, may preclude the use in those countries of certain diagnostic or therapeutic approaches despite endorsement of these by expert groups.

Access to services

Social, economic and geographical factors influence the ability of individuals and populations to access health services. Poverty, disability and age may all impair the motivation and/or ability of people to seek or accept medical advice and this is compounded by the need to travel long distances when the distribution of specialist units and diagnostic facilities is uneven. Low levels of car ownership and poor local transport systems also have a major impact on accessibility. These factors may affect optimal protocols for investigation, treatment and follow-up of individuals.

These problems are particularly evident when the service is provided within a secondary or tertiary care setting. Provision of services by primary care providers should be encouraged when possible since in most cases this will improve accessibility for the individual.

National/regional priorities

Nationally recognised health priorities may vary between countries and regions in Europe and have a strong influence on service provision. Political priorities are often relatively short-term and are influenced by both financial and political imperatives. In contrast, pressure from associations that represent patient groups is mainly driven by patient-related issues and more emphasis is put on long-term issues. Cultural differences between countries

affect the perception of different diseases and notions of risk and may to some extent determine the level of priority afforded to a particular disease area.

How to overcome these barriers

Stakeholders who wish to implement these musculoskeletal strategies need to identify which of these barriers are most pertinent to their country and prioritise action accordingly. Given the low priority that is given to musculoskeletal health, in most member states it is likely that all implementation plans will include interventions that seek to inform and lobby policy makers and funders in order to raise it higher on their agenda. Reports such as *The burden of musculoskeletal conditions at the start of the new millennium* (23) which give data on the burden of disease can be used as a vehicle to increase political awareness of the need for action. The evidence-based strategies in this report provide strong data on what action needs to be taken. Given the many competing demands on policy makers it is advisable to select two or three key actions that are the top priority and focus messages to funders on these, emphasising how they will make a difference in reducing the burden of disease. Working in cooperation with leading professional associations and patient groups to deliver this shared message will strengthen your case.

Although lack of political and financial support may seem an overwhelming obstacle to local action it is important to seek to achieve changes to practice in local clinical settings at the same time as lobbying at the national level. Local initiatives can act as demonstration projects to show how the quality of care can be improved and made more efficient if the strategies are adopted. They can also provide useful data on the resources required to implement change which can be used to convince funders and more sceptical providers of the benefits of adopting changes more broadly. Funding for such demonstration projects may be secured through existing initiatives such as quality improvement and assurance programmes.

In seeking to implement the strategies into local clinical practice there are a variety of barriers that may impede change and which should be identified and addressed at the implementation planning stage.

Barriers to local initiatives

Lack of Awareness and Familiarity with Guidelines

Providers may be casually aware of guidelines but this does not guarantee familiarity with their specific recommendations or the ability to apply them correctly.

Lack of Health Care Provider Self-efficacy

Self-efficacy is the individual's belief in their ability to perform a certain behaviour. Low self-efficacy is associated with a lack of confidence in one's ability or a lack of preparation and may result in poor adherence to a guideline. It may account for the slow adoption of a new surgical procedure or reluctance to use or refer to new diagnostic technology.

Lack of awareness, familiarity and self-efficacy may be addressed by professional educational interventions.

Lack of Agreement and Lack of Outcome Expectancy

Clinicians may not agree with the content of a particular guideline or the concept of guidelines in general. Outcome expectancy is the expectation that a given behaviour will lead to a particular consequence. If a physician believes that a recommendation will not lead to an improved outcome they are less likely to implement it. They may also have valid concerns about possible negative consequences of applying a guideline recommendation to a particular patient.

Professional educational interventions, in particular the use of opinion leaders, peer influence, and local consensus development provide opportunities for providers to air disagreements with national guidelines and to reach local solutions for changing practice which are more likely to be adhered to. Resistance to the concept of guidelines can be addressed by stressing that best practice occurs when there is a fusion of knowledge derived from the best available evidence, clinical experience and knowledge of the patient's lifestyle and preferences.

Inertia

Clinicians may lack the motivation to change existing practice, considering guidelines too difficult to implement, often due to heavy existing workload commitments, or irrelevant to the complexity of routine consultations (12). Where multiple guidelines exist these may create uncertainty and provide further opportunity for inertia. An initial force that will stimulate change, professional, personal, social, financial, or regulatory may be required.

In such situations creating systems that support the desired clinical behaviour rather than trying to change the behaviour of the individual health and social care provider may be most effective (1). Evidence of the benefits of previous change pilots in terms of impact on workload, improved patient care and higher patient satisfaction can also help to persuade late adopters to change their behaviour. Peer pressure and financial incentives may also be effective.

Guideline-related barriers

Guidelines recommending the change or elimination of an established behaviour are more difficult to implement than those that recommend adding a new behaviour. The complexity of the change in practice and whether an innovation can be experimented with on a limited basis affect adoption (24).

The implementation plan should ensure that the prioritised strategies are clearly defined and that the necessary changes to practice are identified. Change champions will need to negotiate these changes with local stakeholders, using pilot studies to test their feasibility and effectiveness.

Patient-related barriers

The inability to reconcile patient preferences with guideline recommendations is a barrier to adherence (25). Patients may be resistant or perceive no need for the recommended action.

Health education interventions, review of care plans with patients, and reminders may overcome such resistance but clinicians can only seek to influence, not determine patient preferences. Identifying potential obstacles that patients may face in complying with advice are particularly important and should be discussed at the time of consultation; these can include: financial constraints, prevailing opinion and peer pressure, previous experience, lack of self-efficacy and lack of belief in the value of the proposed change.

System-related barriers

Poor reimbursement, increased practice costs, insufficient staff, high clinical workload, and lack of time are all key obstacles to implementing change (12;26). Change may be further constrained when it involves co-ordinating between health and social care providers.

These obstacles may be cited by health care providers but they are often based on anticipated costs rather than evidence and may be linked to their lack of knowledge,

attitudes, skills and inertia. Small-scale pilots that involve organisational interventions can provide data on the actual impact on resources and help to convince sceptics as to the feasibility of change. Senior level managerial and clinical support is important for such system-wide approaches and

may be achieved by aligning change with quality improvement initiatives and other strategic objectives.

Scientific, organisational and behavioural factors shape practice. Identifying the major barriers to change and selecting interventions that aim to address these specific constraints is a key part of any implementation plan.

5.6 Implementation of the Bone and Joint Strategies

The previous sections provide general guidance on how to ensure that implementation plans are effective. In this section specific advice is offered on how to implement the bone and joint strategies. Table 5.7 identifies the key sections that should be included in an implementation plan developed by the local task group. It should be stressed that there is no “ideal” way to implement the strategies, it will depend on the local, regional or national context.

Where barriers to improving the prevention and treatment of musculoskeletal disease exist at the national level, stakeholders may wish to initiate action at both the national and local level concurrently. Local implementation is particularly important as such “demonstration projects” can provide evidence of the benefits and cost of changing practice.

Table 5.7 Key Sections of an Implementation Plan

Key Sections of an Implementation Plan
<ul style="list-style-type: none"> • Aspects of Care to be addressed (who will benefit) • Rationale for Action / Change • Key Messages • Action/Change Required • Potential Barriers to Change • Implementation Interventions to be used • Time Frame for Implementation • Resourcing the Plan • Specific Responsibilities and Milestones (these may take the form of Action Plans for particular stakeholders responsible for implementation) • Communications (providing information regarding the implementation plan and its progress) • Monitoring Progress • Evaluating Results

Implementation at the local level

Aim of Implementation

To achieve change in clinical practice in line with the strategies recommended in this report.

Your objectives

These will vary according to the clinical setting, the extent to which current practice does not adhere to guideline recommendations, and the priority areas for action. It is important to identify where guidelines are already being

met and where there is a major gap between recommended and current practice.

In order to identify your main objectives the first step will be to set up a local task group of key local stakeholders, using this report as a basis for discussion.

Possible Stakeholders

These may include some or all of the following groups. It will vary depending on the strategy being implemented. In

each case identify named individuals who can influence the achievement of your objectives.

- Clinical providers in primary, secondary care and rehabilitation
- Social and community care providers
- Managers of clinical and social services
- Local public health doctors
- Local professional organisations
- Local patient organisations
- Local health care funders
- Local legislators/civil servants
- Local media
- Patients
- General public
- Local pharmaceutical and device representatives
- Local employers and employee representatives

Specify the rationale for action at the local level

Identify the arguments that you need to use to persuade the stakeholder groups that you are targeting to take action. These will include:

- The burden of disease for that community including the cost to health and social services and society
- Evidence based strategies are available that can reduce this burden. These strategies have been identified by national experts in the field and can be incorporated into routine practice.
- The recommendations can be integrated into existing health education and quality improvement programmes that seek to promote health and to improve standards of care.
- Identify why it is in their particular interest to take action (referral patterns create extra work for primary care and increase length of waiting time, diagnostic technology is currently being used inappropriately, poor prescribing patterns are a heavy cost to local services which could be reduced by these strategies; problems in accessing musculoskeletal services have been identified as a source of patient dissatisfaction, etc)

Identify the key messages for local providers and health care funders

Primary Care:

- Review current practice and services amongst the population at risk or amongst those with early onset of bone and joint problems. Ensure that appropriate pharmacological and lifestyle interventions have been provided based on guideline recommendations and patient needs. Identify priority areas for action.
- Identify problems of integration with social care, seek patient views and take amendatory action as necessary.
- Review referral procedures in terms of ease of access to secondary specialist care. Identify opportunities for better integration and faster access.
- Assess follow-up provided after discharge from acute setting – improve access to appropriate rehabilitation and pain management services as necessary.
- Provide patients with information as required regarding risk reduction and for those with disease treatment and pain management advice.

Secondary Care:

- Review current practice and access to services in light of guideline recommendations. Identify priority areas for action.
- Identify clinical and managerial lead to direct implementation programme.
- Assess follow-up after acute episode to ensure patients receive appropriate interventions for underlying musculoskeletal conditions.
- Review access to pain management and rehabilitation programmes in terms of appropriateness, speed, access to aids etc.
- Review discharge procedures in terms of patient needs to promote integration with rehabilitation, primary and social care.
- Provide patients with information as required regarding risk reduction and for those with disease regarding their treatment and pain management advice.

Social Care

- Assess the effectiveness of programmes to encourage fall prevention and improve these as necessary.
- Provide older people with advice on creating a safe home environment and fall prevention measures.
- Review service integration with primary care.

Health care funders / purchasers

- Review level of risk and burden of disease in local population to establish its priority for action.

- Work with local clinicians and managers to identify how current funding could be used differently to implement priority recommendations.
- Support small-scale pilots to assess cost and clinical effectiveness of implementing one or more of the strategies.
- Where successful support roll-out through changing reimbursement processes as necessary.

Develop and execute your implementation plan

Produce an implementation plan that seeks to achieve your objectives. This should be planned and executed in line with the principles outlined previously. The case study below provides an example of an implementation strategy in a clinical setting. The checklist that follows (Figure 5.8) has been developed to help local lead clinicians to implement the strategies.

A case study: Implementation of the Dutch physiotherapy guidelines for low back pain – a case study

In 2001 clinical physiotherapy guidelines for low back pain were issued by the Dutch Royal Society for Physical Therapy in order to assist physiotherapists in making evidence-based decisions. The guidelines aimed to be realistic and appropriate, striking a balance between evidence and current best practice. The Society used the standard passive method of introducing these guidelines by disseminating them among its members. However, a multi-disciplinary expert group of clinicians and researchers obtained funding for a research study which aimed to test whether an active multifaceted implementation strategy would be more effective in achieving uptake of the guidelines.

The study was designed as a randomised controlled trial. Three hundred and twenty-five practices were invited to participate in the study and 68 physiotherapy practices expressed interest; 34 were allocated to the intervention group, 34 practices acted as the control. No financial incentive was required to encourage participation. In order to increase the effectiveness of the intervention a survey was conducted to identify physiotherapists' expected barriers to implementation of the guidelines. As a result of this a multifaceted intervention was developed: two group training sessions of 2.5 hours duration was provided to groups of 8-12 physiotherapists, preceded on each occasion by 2 hours of preparation. The first training session involved interactive education and discussion about the guidelines, and role-playing to train physiotherapists for difficult situations which might arise as a result of their recommendations. Four weeks later a second group session was held enabling participants to discuss their experience of using the guidelines in practice, and to receive feedback on their current

management and two reminders with respect to patient education. The control group received the guidelines by mail along with four forms: a self-evaluation form to assess whether the current management was consistent with the guideline recommendations, two forms facilitating discussion with other physiotherapists and general practitioners, and a copy of the Quebec Back Pain Disability Scale. At the same time an article about the development of the guidelines was published in a Dutch professional journal for physiotherapists.

The effects of the intervention on both process of care and health outcome measures were assessed. The intervention increased overall adherence to the main recommendations of the guidelines from 30% in the control group to 52% in the intervention arm (27). Patients were followed up for 12 months to assess the impact on health outcomes: physical functioning; pain; sick leave; beliefs regarding coping with back pain. At the 12 month point there was no difference in health outcome of the 215 patients who participated in the intervention and control arms of the study (27). This lack of effect may be due either to the implementation intervention being inadequate or to the self-selection of the physiotherapists in the study who might already have been interested in the management of low back pain. The guidelines largely supported existing practice although there were a few recommendations that were more challenging.

This study illustrates how important it is to test implementation interventions first before seeking their widespread adoption. It also emphasises the importance of first identifying where there is a major gap between current practice and guideline recommendations and prioritising this for active implementation strategies.

Table 5.8 Implementation Checklist

	Yes	No
Do you know what particular aspects of the treatment and prevention of musculoskeletal disease need to be improved in your setting?	<input type="checkbox"/>	<input type="checkbox"/>
Do your objectives relate to meeting these local needs and priorities and are they realistic and achievable?	<input type="checkbox"/>	<input type="checkbox"/>
Have you identified the bone and joint strategies that need to be implemented to meet these objectives?	<input type="checkbox"/>	<input type="checkbox"/>
Have you formed a task group to develop an implementation plan?	<input type="checkbox"/>	<input type="checkbox"/>
Have you identified the stakeholders who are affected by or need to be involved in changing policy and or practice?	<input type="checkbox"/>	<input type="checkbox"/>
Have you identified the key decision makers?	<input type="checkbox"/>	<input type="checkbox"/>
Have you involved the relevant "local champion/s"?	<input type="checkbox"/>	<input type="checkbox"/>
Have you identified <u>all</u> the potential barriers?	<input type="checkbox"/>	<input type="checkbox"/>
Do your planned interventions address these barriers?	<input type="checkbox"/>	<input type="checkbox"/>
Have you identified appropriate incentives and rationale for change?	<input type="checkbox"/>	<input type="checkbox"/>
Have you an appropriate dissemination plan?	<input type="checkbox"/>	<input type="checkbox"/>
Have you identified who is responsible for specific actions?	<input type="checkbox"/>	<input type="checkbox"/>
Have you identified the costs of implementation?	<input type="checkbox"/>	<input type="checkbox"/>
Have you obtained resources for implementation?	<input type="checkbox"/>	<input type="checkbox"/>
Have you built in monitoring and evaluation into the plan?	<input type="checkbox"/>	<input type="checkbox"/>

Implementation at the national level

Aim of Implementation

To achieve support from key decision makers for action on musculoskeletal health in accordance with the evidence-based strategies identified in this report.

Your Strategic Objectives

Identify the specific objectives that you wish to achieve, drawing on the strategic recommendations outlined in Part 4. These will vary by member state but could include any of the following:

- To include action on musculoskeletal health in national public health initiatives. These may be targeted at specific sub-groups such as those at high risk or people with established disease.
- To increase reimbursement for diagnostic procedures in order to improve case finding of those at high risk of bone and joint disease.
- To add indicators regarding musculoskeletal health to the national dataset so that evidence of the national burden of disease is collected.
- To revise education on bone and joint health in order to improve the competency of health and social care professionals in treating and preventing musculoskeletal conditions.

In order to identify key national objectives the first step may be to convene a meeting of key stakeholders, using this report as a basis for discussion. In any such discussions prioritise those recommendations that will attract support from a wide number of stakeholders.

Possible Stakeholders

These may include some or all of the following groups. For each group identify named individuals who are the key decision makers and who can influence the achievement of your objectives.

- Legislators
- Policy advisors
- Civil servants
- Health care funding agencies
- Health technology assessment agencies
- Professional associations
- Patient organisations
- Quality accreditation agencies
- Health correspondents on the national media
- Employer and employee organisations
- General public

The Quebec Agency for Health Technology Assessment (AETMIS) was effective in getting its recommendations taken up by the Quebec government because it successfully identified a local champion within the Ministry of Health and Social Care who recognised the importance of developing policies based on a rigorous review of evidence on effectiveness and cost effectiveness. This individual worked with the Agency and was able to help recommendations influence legislation and policy.

Specify the rationale for action at the national level

Identify the arguments that you need to use to persuade decision makers to take action. These will include:

- The burden of disease including the cost to health and social services and society
- Evidence based strategies are available that can reduce this burden. These strategies have been identified by national and international experts in the field.
- The recommendations can be integrated into existing programmes that seek to promote health and to improve standards of care
- Identify why it is in their particular interest to take action (it affects x million of their voters or readers of their newspaper, diagnostic technology is currently being used inappropriately, poor prescribing patterns are a heavy cost to the health service which could be reduced by these strategies etc)

In British Columbia a Bone Health and Fracture Prevention Strategy was developed by a multi-sectoral group, chaired by the Women's Health Bureau, at the Ministry of Health. They developed a workbook to help community planners, health authorities and health professionals to promote good musculoskeletal health. The idea of the workbook was to guide on how to modify and build on existing (but perhaps different) approaches adopted in different regions of British Columbia. Augmenting and modifying existing approaches may be easier to achieve than trying to implement a strategy from scratch. Key aspects they emphasised:

- Getting the numbers straight! – Providing information on the health and socio-economic consequences of osteoporosis. [Powerpoint presentation included with workbook which might be used in presentations to stakeholders]
- Emphasising that there are solutions e.g. fractures can be prevented
- Collecting some background data to present to stakeholders to support development of strategy – e.g.

on social determinants of bone health (data on healthy lifestyles for instance) – prevalence data, data on hospitalisations due to bone related problems (e.g. falls)

- Identifying existing policies and programmes that are beneficial to bone health, and identifying gaps – how could existing programmes be modified to plug these gaps (eg Programmes for Nutrition, Physical Activity, Fall Prevention, Medical Services)
- Recognising the need to prioritise, propose policy changes and new programmes where appropriate

Identify the key messages for decision makers

Specify what action is required to reduce the burden of disease. The key recommendations from the strategies are summarised below. You may wish to identify them all or to highlight priority messages that will make most impact. The focus might be setting based, such as to improve primary care services so that the health and social care needs of patients with musculoskeletal conditions are better integrated, or population based, for example on improving fall prevention in older people.

- The same healthy lifestyle messages used to promote heart health are needed for bone and joint health
- Earlier assessment is required to reduce the future burden of disease
- Appropriate interventions need to be consistently available for risk reduction
- Improve fall prevention to reduce musculoskeletal problems in older people
- Fairer access to effective treatment and rehabilitation is required for people with bone and joint disease
- Better pain management is possible and should be provided. It can improve patients' quality of life and ability to live independently
- Health and social care providers need to improve their integration of services so that they better meet patients' needs
- Better education of health care professionals is needed to improve standards of care
- The burden of musculoskeletal disease can be reduced by employers facilitating early return to employment through work adjustment and flexibility in working hours

Identify what action is required from decision makers

Again this will need to be tailored according to your objectives and the stakeholder groups that you are targeting.

- Develop a national strategy for musculoskeletal health with priorities for action which is disseminated to regional and local level to ensure implementation.

If national priorities have already been set you may wish to focus on achieving specific pieces of work which will help to achieve a national strategy in the longterm.

- Conduct a needs assessment for a specific population to establish its priority for action. You may wish to target a 'politically interesting' sub-group of the population which would enable you to access funds set aside to address their particular needs.
- Take action to reduce inequity in access to care and to improve areas where standards of services are inadequate. Data on difficulties in accessing services in deprived communities will help to stimulate such action.
- Include lifestyle advice re: bone and joint health in generic health promotion programmes
- Conduct a public campaign to increase awareness of bone and joint health, encouraging those with symptoms to seek help, working with other agencies, health promotion, occupational health, social care, patient support groups.
- Establish a working group in conjunction with professional associations to review and improve clinical education and skills base regarding musculoskeletal conditions
- Support workplace programmes that provide advice on good bone and joint health and accident avoidance
- Review with health care funders recent developments in the diagnosis and treatment of musculoskeletal conditions with a view to producing new guidance to ensure the appropriate use of new technology.
- Ask payers to fund small-scale pilot initiatives to assess the impact of implementing these recommendations.

Develop and execute your implementation plan

Produce an implementation plan that seeks to achieve your objectives. This should be planned and executed in line with the principles outlined previously. The following case study provides an example of the process involved in achieving a national strategy for bone and joint health.

A case study on achieving a national strategy for bone and joint health

Political action to improve the prevention of musculoskeletal disease was first prompted in Denmark in 1987 when a health survey conducted by the National Institute of Public Health showed its heavy burden to society. The Institute is a well-respected independent agency with close links to the Ministry of Health. As a result of its research findings, musculoskeletal disease was included as one of five disease areas in Denmark's first national health promotion and disease prevention programme published in 1988.

No specific recommendations for action were made at this time, instead the National Institute of Public Health was commissioned to conduct further research to identify what preventive programmes were being conducted to reduce the burden of musculoskeletal disease in different sectors of society: working life and the labour market; children and youth; prevention as part of treatment; health education. As part of its investigation the Institute conducted a conference with the Directorate of Occupational Health and Safety to highlight areas of good practice and to stimulate recommendations for action. A similar conference was held addressing the goals and mechanisms for promoting awareness of bone and joint health and healthy behaviour in children. The results of the Institute's work were collated in a strategic document published in 1993 entitled *Ideas for the Prevention of musculoskeletal disease in Denmark*. Ideas from this report were first discussed internally with the Minister of Health and formed the basis of an *Action Plan for the Prevention of Musculoskeletal Disease* produced by the Ministry of Health and presented to Parliament in 1995. This policy document contained a prioritised national strategy.

Health Promotion and Disease Prevention Programmes in Denmark are typically discussed in inter-sectoral committees with representatives from 10 ministries (horizontal co-ordination) as well as representatives from local and regional authorities (vertical co-ordination). Then the programme is taken to the Minister of Health and presented to Parliament. The Ministry of Health was charged with coordinating this work and monitoring progress. However, local and regional authorities remained free to choose their own health priorities. Implementation of the national recommendations was assisted by using the local health planning system as a mechanism to encourage local health needs assessments of the burden of musculoskeletal disease and to prompt

local support for action. In addition health promotion tools for use in the workplace and schools were developed nationally for use in local initiatives. Some patient associations and health professionals lobbied for the recommendations to be implemented locally.

This first national strategy has been followed by other policy initiatives. Health Technology Assessment of interventions towards lower back pain resulted in a national strategy, launched by the National Board of Health, and a follow up by multi-professional implementation groups in all counties of Denmark. In 1998 Denmark had its second Health Promotion and Disease Prevention Programme focusing on determinants of health and diseases and on inequality in health. In 2002 the third national programme – Healthy throughout Life – was launched focusing on determinants of health as well as on eight disease groups, one being musculoskeletal diseases. The objective of this part of the programme reads: the number of new cases shall be reduced and expulsion from the labour market due to musculoskeletal diseases shall be prevented.

The Institute for Public Health continues to conduct regular health surveys and although it is too soon for prevention programmes to affect the prevalence of musculoskeletal disease, studies have shown a positive impact on some determinants of disease such as reducing exposure to heavy work and increased population level of physical activity. Also short-term intervention studies have shown a reduced absence from work.

The experience in Denmark shows that good health information systems are vital for making musculoskeletal disease a higher priority as data can signal to politicians and the public that action is required. Securing the sustained support and advocacy of professional bodies and other important stakeholders who have a good channel of communication into the political system is important for placing and maintaining musculoskeletal disease on the political agenda, both nationally and locally. Similarly, using existing planning and health promotion agencies can facilitate local implementation. At all levels inter-sectoral work is needed to involve all those who can influence the various social and economic determinants of health. The case study shows that achieving national action on musculoskeletal disease is feasible but that it is a longterm process that requires sustained stakeholder support and local data regarding the burden of disease to stimulate action.

5.7 Conclusions

This part of the report has aimed to provide guidance to interested stakeholders on how to ensure that the recommendations of this report are translated into changes in policy and practice. Too many guidelines tend to be unused and ineffective because insufficient attention is paid to planning and resourcing their implementation. Although there is no “ideal” method of implementation, this section has identified a number of implementation principles that can influence the success or failure of attempts to implement guideline recommendations. It has also offered specific guidance on how to implement the

bone and joint strategies recommended in this report, and how different stakeholders can initiate action required as identified in Part 4. With this information stakeholders, both local and national, are in a position to develop culturally and contextually appropriate implementation plans to address priority areas for change. Such action is necessary and urgent in order to reduce the burden of musculoskeletal disease in Europe.

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Appendix I

Search Strategy

Two search strategies were undertaken. Both strategies used the same format. The first search strategy took place at the beginning of the project and PubMed and Embase databases were searched between the dates of 1995 – 2001. The second search strategy took place at the end of the project and included the same search but including the date 2002.

Guideline documents searched on PubMed and EMBASE between the dates 1995-2001 and then 2001-2003 using the following strategy:

Descriptor	Connector	Descriptors
Back pain OR Back pain as Mesh Major Topic	AND	Guideline* (medical management) (best practice) (good practice) medical NEAR management best NEAR practice good NEAR practice
Osteoarthritis OR OA as Mesh Major Topic	AND	Guideline* (medical management) (best practice) (good practice) medical NEAR management best NEAR practice good NEAR practice
Osteoporosis as Mesh Major Topic	AND	Guideline* (medical management) (best practice) (good practice) medical NEAR management best NEAR practice good NEAR practice
Rheumatoid Arthritis as Mesh Major Topic	AND	Guideline* (medical management) (best practice) (good practice) medical NEAR management best NEAR practice good NEAR practice
Trauma (as Mesh Major Topic) AND musculoskeletal	AND	Guideline* (medical management) (best practice) (good practice) medical NEAR management best NEAR practice good NEAR practice

Two search strategies were undertaken. Both strategies used the same format. The first search strategy took place at the beginning of the project and PubMed and Embase databases were searched between the dates of 1995 – 2001. The second search strategy took place at the end of the project and included the same search but including the date 2002.

Systematic reviews and meta-analyses searched on PubMed and EMBASE between the dates 1995-2001 and 2001-2003 using the following strategy:

Search Descriptor	Connector	Search Descriptor
Back pain OR Back pain as Mesh Major Topic	AND	("Systematic Review*" OR "Meta-analysis")
Osteoarthritis OR OA as Mesh Major Topic	AND	("Systematic Review*" OR "Meta-analysis")
Osteoporosis as Mesh Major Topic	AND	("Systematic Review*" OR "Meta-analysis")
Rheumatoid Arthritis as Mesh Major Topic	AND	("Systematic Review*" OR "Meta-analysis")
Trauma (as Mesh Major Topic) AND musculoskeletal	AND	("Systematic Review*" OR "Meta-analysis")

Appendix 2

Selection and Appraisal Process

Guidelines, systematic reviews were appraised by the following methodology before the evidence was considered.

Systematic Reviews

Initial Appraisal

Screening Checklist

Is this a comprehensive systematic review of controlled studies?

If not, reject

Is it relevant to the project?

- are the conditions / problems being treated and patient groups relevant
- are the interventions relevant
- are the outcome measures of interest for the project

If not, reject

Is there a methods section describing

- finding and including all relevant trials?
- if no, be very careful
- how the validity of the studies was assessed?
- if no, be very careful

Were the results consistent over studies?

(of lesser importance, but inconsistencies could be hinting at publication bias)

What is the magnitude and the precision of the (treatment) effect?

(of lesser importance, but limits value of review)

Full Appraisal

Review Criteria (Cochrane)

- Clearly stated title and objectives for the review
- Comprehensive strategy to search for studies that address the objectives of the review (relevant studies to include unpublished as well as published studies)
- Explicit and justified criteria for the inclusion or exclusion of any study
- Comprehensive list of all studies identified
- Clear presentation of the characteristics of each study included and analysis of methodological quality
- Comprehensive list of all studies excluded and justification for exclusion
- Clear analysis of the results of the eligible studies using statistical synthesis of data (meta-analysis) if appropriate and possible
- Sensitivity analyses of the synthesised data if appropriate and possible
- Structured report of the review clearly stating the aims, describing the methods and materials and reporting the results

Guidelines

Initial Appraisal

Screening Checklist

Is it relevant to the project?

- are the conditions / problems being treated and patient groups relevant
- are the interventions relevant
- are the outcome measures of interest for the project

If not, reject

Is it a guideline? *If not, reject*

- for this project, a guideline is defined as recommendations based on a comprehensive review of the literature
- if a single controlled study, *then reject*
- if an educational review based only on expert opinion, *then reject*

- if the guideline is evidence based or consensus based, *then consider*
- ideally the guideline should be based on reviews that were systematically done, *if yes then accept*

Full Appraisal

Appraisal Criteria

The AGREE Tool was used for appraising guidelines. This can be found at:

[Guideline Assessment Tools\AGREE final \(English version\)1.doc](#)

Appendix 3

OSTEOARTHRITIS

Guideline Name	Date	Full Document	Organisation	Guideline Group	Citation
Exercise prescription for older adults with osteoarthritis pain: Consensus practice recommendations	2001	http://www.americangeriatrics.org/products/positionpapers/oa_guidelines.pdf	American Geriatrics Society www.americangeriatrics.org	American Geriatrics Society Panel on Osteoarthritis and Exercise	Lundebjerg N. Exercise prescription for older adults with osteoarthritis pain: Consensus practice recommendations. Journal-of-the-American-Geriatrics-Society 2001; 49:808-823.
Osteoarthritis: new insights. Part 1: the disease and its risk factors	2000	http://www.annals.org/cgi/reprint/133/8/635.pdf	National Institutes of Health, USA www.nih.gov	Summary of an NIH Conference Felson DT, Lawrence RC, Dieppe PA, Hirsch R, Helmick CG, Jordan JM, Kington RS, Lane NE, Nevitt MC, Zhang Y, Sowers M, McAlindon T, Spector TD, Poole AR, Yanovski SZ, Ateshian G, Sharma L, Buckwalter JA, Brandt KD, Fries JF.	Felson DT, conference chair. Osteoarthritis: new insights. Part 1: The disease and its risk factors. Ann Intern Med. 2000; 133:635 – 646.
Osteoarthritis: new insights. Part 2: treatment approaches	2000	http://www.annals.org/cgi/reprint/133/9/726.pdf	National Institutes of Health, USA www.nih.gov	Summary of an NIH Conference Felson DT;Lawrence RC;Hochberg MC;McAlindon T;Dieppe PA;Minor MA;Blair SN;Berman BM;Fries JF;Weinberger M;Lorig KR;Jacobs JJ;Goldberg V.	Felson DT, conference chair. Osteoarthritis: new insights. Part 2: Treatment approaches. Ann Intern Med. 2000; 133:726- 737.
Recommendations for the management of knee osteoarthritis: report of a task force of the Standing Committee for International Clinical Studies Including Therapeutic Trials (ESCISIT)	2000	http://ard.bmjournals.com/cgi/reprint/59/12/936.pdf	European League Against Rheumatism (EULAR) www.eular.org	A task force for the EULAR Standing Committee for Clinical Trials Pendleton A, Arden N, Dougados M, Doherty M, Bannwarth B, Bijlsma JWJ, Cluzeau F, Cooper C, Dieppe PA, Günther K-P, Hauselmann HJ, Herrero-Beaumont G, Kaklamanis PM, B Leeb, Lequesne M, Lohmander S, Mazieres B, Mola E-M, Pavelka K, Serni U, Swoboda B, Verbruggen AA, Weseloh G, Zimmermann-Gorska I.	Pendleton A, Arden N, Dougados M et al. EULAR Recommendations for the Management of Knee Osteoarthritis : report of a task force of the Standing Committee for International Clinical Studies Including Therapeutic Trials Ann Rheum Dis 2000; 59:936-44.
Recommendations for the medical management of osteoarthritis of the hip and knee	2000	http://www.rheumatology.org/publications/guidelines/oa-mgmt/oa-mgmt.asp?aud=mem	American College of Rheumatology (ACR) Subcommittee on Osteoarthritis www.rheumatology.org	American College of Rheumatology Subcommittee on Osteoarthritis Guidelines Altman RD, Hochberg MC, Moskowitz RW, Schnitzer TJ.	Recommendations for the Medical Management of Osteoarthritis of the Hip and Knee. Arthritis Rheumatism 2000; 43:1905-15.

RHEUMATOID ARTHRITIS

Guideline Name	Date	Full Document	Organisation	Guideline Group	Citation
An evidence-based medicine approach to the diagnosis and management of musculoskeletal complaints.	1997			Ellrodt AG, Cho M, Cush, JJ, Kavanaugh AF, Lipsky PE.	Ellrodt AG, Cho M, Cush JJ, Kavanaugh AF, Lipsky PE. An evidence-based medicine approach to the diagnosis and management of musculoskeletal complaints. Am J Med 1997; 103(6A):3S-6S.
Consensus recommendations for the assessment and treatment of rheumatoid arthritis.	2001	http://www.arthritis-research.org/Documents/consensus0.doc		Wolfe F, Cush JJ, O'Dell J R, Kavanaugh A, Kremer J M, Lane N E, Moreland L W, Paulus H E, Pincus T, Russell AS, Wilskie KR.	Wolfe F, Cush JJ, O'Dell JR, Kavanaugh A, Kremer JM, Lane NE et al. Consensus recommendations for the assessment and treatment of rheumatoid arthritis. J Rheumatol 2001; 28[6]:1423-1430.
Corticosteroids in rheumatoid arthritis: How best to use them?	1995			Bijlsma J W J, Van Everdingen AA, Jacobs J W G.	Bijlsma JW, Everdingen AA, Jacobs JW. Corticosteroids in rheumatoid arthritis; how best to use them? Clin Immunotherapy 1995; 3:271-286.
Early referral recommendation for newly diagnosed rheumatoid arthritis: evidence based development of a clinical guide.	2002	http://ard.bmjournals.com/cgi/reprint/61/4/290		Emery P, Breedveld FC, Dougados M, Kalden JR, Schiff MH, Smolen JS.	Emery P, Breedveld FC, Dougados M, Kalden JR, Schiff MH, Smolen JS. Early referral recommendation for newly diagnosed rheumatoid arthritis: evidence based development of a clinical guide. Ann Rheum Dis 2002; 61(4):290-297.
Folate supplementation during methotrexate treatment of patients with rheumatoid arthritis. An update and proposals for guidelines.	2001			Endresen GK, Husby G.	Endresen GK, Husby G. Folate supplementation during methotrexate treatment of patients with rheumatoid arthritis. An update and proposals for guidelines. Scand J Rheumatol 2001; 30(3):129-134.
Guidelines for monitoring of NSAIDs: Who listened?	2000			Rothenberg RJ, Holcomb JP.	Rothenberg R, Holcomb J. Guidelines for monitoring of NSAIDs, who listened? Journal of Clinical Rheumatology 2000; 6(5):258-265.
Guidelines for the management of rheumatoid arthritis: 2002 Update.	2002	http://www.rheumatology.org/publications/guidelines/raguidelines02.asp?aud=mem	American College of Rheumatology (ACR) www.rheumatology.org	American College of Rheumatology Subcommittee on Rheumatoid Arthritis	Guidelines for the management of rheumatoid arthritis: 2002 Update. Arthritis Rheum 2002; 46(2):328-346.

Guidelines for the use of cyclosporine in rheumatoid arthritis.	1995			Tugwell P, Baker P.	Tugwell P, Baker P. Guidelines for the use of cyclosporine in rheumatoid arthritis. Clin Rheumatol 1995; 14 Suppl 2:37-41.
Issues of consensus and debate for economic evaluation in Rheumatology.	2001			Coyle D, Welch V, Shea B, Gabriel S, Drummond M, Tugwell P.	Coyle D, Welch V, Shea B, Gabriel S, Drummond M, Tugwell P. Issues of consensus and debate for economic evaluation in rheumatology. J Rheumatol 2001; Journal-of-Rheumatology. 2001; 28:3-647.
Management of therapy-resistant rheumatoid arthritis.	1999			Kroot EJ , Van de Putte L, van Riel PLCM.	Kroot EJ, Van de Putte LB, van Riel PL. Management of therapy-resistant rheumatoid arthritis. Baillieres Best Pract Res Clin Rheumatol 1999; 13(4):737-752.
Methotrexate use in rheumatoid arthritis. A clinician's perspective.	2000	http://www.sciencedirect.com/science?_ob=MIimg&_imagekey=B6T27-40KR3ST-B-1&_cdi=4911&_orig=search&_coverDate=05%2F31%2F2000&_qd=1&_sk=999529997&view=c&wchp=dGLbVtb-zSkzV&_acct=C000054595&_version=1&_userid=2689198&md5=196757a22bf9235149bf05f50d809d3e&ie=f.pdf		Alarcon GS.	Alarcon GS. Methotrexate use in rheumatoid arthritis. A Clinician's perspective. Immunopharmacology 2000; 47(2-3):259-271.
NICE guidance on COX-2 inhibitors.	2001	http://www.nice.org.uk/pdf/coxiifullguidance.pdf	National Institute for Clinical Excellence, UK (NICE) www.nice.org.uk		Guidance on the use of cyclo-oxygenase (Cox) II selective inhibitors, celecoxib, rofecoxib, meloxicam and etodolac for osteoarthritis and rheumatoid arthritis. Technology Appraisal No. 27. 2001. National Institute for Clinical Excellence, London, UK.
Rheumatoid arthritis: guidelines for emerging therapies.	2001	http://www.ajmc.com/files/articlefiles/AJMC2001junBlumberg617_26.pdf		Blumberg SN, Fox DA.	Blumberg SN, Fox DA. Rheumatoid arthritis: guidelines for emerging therapies. Am J Manag Care 2001; 7(6):617-626.
Management of Early Rheumatoid Arthritis.	2000	http://www.sign.ac.uk/pdf/sign48.pdf	Scottish Intercollegiate Guidelines Network (SIGN), www.sign.ac.uk	<i>Guideline Development Group:</i> Capell H (Chair), Morrison E, Brandon W, Coote J, Duncan C, Gough F, Hannah M, Hosie G, Madhok R, Maiden N, McGhee D, Nuki G, Rasdale P, Rennie N, Steven M, Young G, Wiener-Ogilvie S, Wood D.	SIGN. Management of Early Rheumatoid Arthritis. 2000.

Standardised nomenclature for glucocorticoid dosages and glucocorticoid treatment regimens: current questions and tentative answers in Rheumatology.	2002	http://ard.bmjournals.com/cgi/reprint/61/8/718	European League Against Rheumatism (EULAR) www.eular.org	A workshop under the auspices of the EULAR Standing Committee on International Clinical Studies including Therapeutic Trials. Buttgereit F, da Silva J A P, Boers M, Burmester G-R, Cutolo M, Jacobs J, Kirwan J, Köhler L, van Riel P, Vischer T, Bijlsma J W J.	Buttgereit F, Da Silva JA, Boers M, Burmester GR, Cutolo M, Jacobs J et al. Standardised nomenclature for glucocorticoid dosages and glucocorticoid treatment regimens: current questions and tentative answers in rheumatology. Ann Rheum Dis 2002; 61(8):718-722.
Sundhedsstyrelsen: Leddegigt – Medicinsk Teknologivurdering af Diagnostic og Behandling. Medicinsk Teknologivurdering. Copenhagen.	2002	http://www.mtv-institutet.dk/publikationer/docs/Leddegigt/SST_leddeg_AS5.pdf	Sundhedsstyrelsen (National Board of Health, Denmark) www.sst.dk		Sundhedsstyrelsen.: Leddegigt – Medicinsk Teknologivurdering af Diagnostic og Behandling. Medicinsk Teknologivurdering 2002;4 (2), Copenhagen.
Updated consensus statement on biological agents for the treatment of rheumatoid arthritis and other rheumatic diseases (May 2002).	2002	http://ard.bmjournals.com/cgi/reprint/61/suppl_2/ii2		Furst DE, Breedveld FC, Kalden JR, Smolen JS, Antoni CE, Bijlsma JW, Burmester GR, Cronstein B, Keystone EC, Kavanaugh A, Klareskog L	Furst, DE, Breedveld FC, Kalden JR et al. Updated consensus statement on biological agents for the treatment of rheumatoid arthritis and other rheumatic diseases (May 2002). Ann Rheum Dis 2002; 61 Suppl 2:ii2-7.
Updated consensus statement on tumour necrosis factor blocking agents for the treatment of rheumatoid arthritis.	2000	http://ard.bmjournals.com/cgi/reprint/59/suppl_1/i1		Furst DE, Breedveld, FC, Burmester GR, Crofford JJ, Emery P, Feldmann M, Kalden J R, Kavanaugh AF, Keystone EC, Klareskog LG, Lipsky PE, Maini RN, Russell AS, Scott DL, Smolen JS, Van de Putte LBA, Visher TL, Weisman MH.	Furst DE, Breedveld FC, Burmester GR, Crofford JJ, Emery P, Feldmann M et al. Updated consensus statement on tumour necrosis factor blocking agents for the treatment of rheumatoid arthritis (May 2000). Ann Rheum Dis 2000; 59 Suppl 1:i1-i2.
US consensus guidelines for the use of cyclosporin A in rheumatoid arthritis.	1999			Cush JJ, Tugwell P, Weinblatt M, and Yocum D.	Cush JJ, Tugwell P, Weinblatt M, Yocum D. US consensus guidelines for the use of cyclosporin A in rheumatoid arthritis. J Rheumatol 1999; 26(5):1176-1186.

BACK PAIN

Guideline Name	Date	Full Document	Organisation	Guideline Group	Citation
Empfehlungen zur Therapie von Kreuzschmerzen (Treatment guideline – backache).	1997	http://www.akdae.de/35/10Hefte/91_Kreuzschmerzen_2000_2Auflage.pdf	Drug Committee of the German Medical Society in Germany (Arzneimittelkommission der deutschen Ärzteschaft) www.akdae.de		Handlungsleitlinie - Rückenschmerzen. Empfehlungen zur Therapie von Rückenschmerzen, Arzneimittelkommission der deutschen Ärzteschaft. (Treatment guideline - backache. Drug committee of the German Medical Society). Zeitschrift für Arztliche Fortbildung und Qualitätssicherung Aug 1997; 91(5): 457-460; [Germany]
Acute low back problems in adults : treatment and assessment	1994	http://www.ncbi.nlm.nih.gov/books/bv.fcgi?rid=hstat6.chapter.25870 (Summary)	Agency for Health Care Policy and Research (AHCPR). US Department of Health and Human Services, Public Health Service, Executive Office Center, Suite 501, 2101 East Jefferson Street, Rockville, MD 20852, USA. www.ahcpr.gov	Bigos SJ (Chair), Bowyer OR, Braen GR, Brown KC, Deyo RA, Haldeman S, Hart JL, Johnson EW, Keller RB, Kido DK, Liang MH, Nelson RM, Nordin M, Owen BD, Pope MH, Schwartz RK, Stewart DH, Triano JJ, Tripp L, Turk D, Watts C, Wienstein J.	Bigos S, Bowyer O, Braen G et al. Acute low back problems in adults. Clinical practice guideline no. 14. AHCPR publication no. 95-0642. Rockville, MD: Agency for Health Care Policy and Research, Public Health Service, U.S. Department of Health and Human Services. December 1994; [USA]
Low Back Pain. Frequency, Management and Prevention from an HTA Perspective	1999	http://www.sst.dk/Applikationer/cemtv/publikationer/docs/Low-back-pain/LowBackPain.pdf	Danish Institute for Health Technology Assessment. National Board of Health, 13, Amaliegade, PO Box 2020, 1012 Copenhagen, Denmark. www.sst.dk	Manniche C (Chairman), Ankjaer-Jensen A, Olsen A, Fog A, Williams K, Biering-Sørensen F, Kryger-Baggesen P, Mosdal C, Thyregod HC, Jensen EM, Pedersen N-F, Lings S, Remvig L, Bendix T.	Low back pain. Frequency, management and prevention from an HTA perspective.. Danish Health Technology Assessment 1999.; [Denmark]
Clinical Practice Guidelines: diseases of the low back	1999		The Finnish Medical Association. Box 49, FIN-00501, Helsinki. www.laakariliitto.fi		Malmivaara A, Kotilainen E, Laasonen E, Poussa M, Rasmussen M. Clinical Practice Guidelines: diseases of the low back. (Finnish, available in English). The Finnish Medical Association Duodecim 1999; [Finland]
Standaard Lage-Rugpijn (Low Backpain Guideline)	1996	http://nhg.artsennet.nl/upload/104/standaarden/M54/svk.htm	Dutch College of General Practitioners (NHG), PO Box 3231, 3502 GE Utrecht, The Netherlands	Faas A, Chavannes AW, Koes AW, van den Hoogen JMM, Mens JMA, Smelee IJM, Romeijnders ACM, van der Laan JR.	Faas A, Chavannes AW, Koes BW, Van den Hoogen JMM, Mens JMA, Smelee IJM, Romeijnders ACM, Van der Laan JR.. Clinical practice guidelines for low back pain. (Dutch, available in English). Huisarts Wet 1996;39:18-31; [the Netherlands]

Clinical guidelines for the management of low back pain in primary care: an international comparison	2001			Koes BW, van Tulder MW, Ostelo R, Kim BA, Waddell G.	Koes BW, van Tulder MW, Ostelo R, Kim BA, Waddell G. Clinical guidelines for the management of low back pain in primary care: an international comparison. Spine 2001; 26(22):2504-2513.
Acute Low Back Pain	1999	http://nhmrc.gov.au/publications/pdf/cp59.pdf	National Health and Medical Research Council www.nhmrc.gov.au		Acute Low Back Pain Guideline (1999)
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