

ENTITLEMENT ELIGIBILITY GUIDELINES OSTEOARTHROSIS / OSTEOARTHRITIS

This guideline excludes inflammatory and depositional joint disease.

MPC See individual code for affected joint
ICD-9 715

DEFINITION

For VAC purposes, osteoarthrosis is a non-inflammatory joint disease characterized by degeneration of the articular cartilage, hypertrophy of bone at the margins, and changes in the synovial membrane. It is also known as Degenerative Arthritis, Hypertrophic Arthritis and Degenerative Joint Disease.

The terms *osteoarthrosis* and *osteoarthritis* are used interchangeably in the medical community and the general public. For the purpose of this guideline, the terms are considered synonymous and will hereinafter be referred to as “OA”.

PLEASE NOTE: An application for pension entitlement for OA requires that a “disability” from OA be present. For VAC pension purposes, a “disability” from OA is demonstrated when relevant signs and/or symptoms are present. X-ray evidence alone is insufficient, as the condition must be symptomatic. X-ray findings do not correlate well with symptoms of OA. While it is accepted that osteophytes and joint space narrowing are signs of OA, they do not mean that OA is symptomatic.

This guideline excludes inflammatory joint disease, examples of which are as follows:

- rheumatoid arthritis
- Reiter’s syndrome
- psoriatic arthritis
- ankylosing spondylitis (peripheral joints)
- septic arthritis
- arthritis associated with Crohn’s disease
- arthritis associated with ulcerative colitis

This guideline excludes depositional joint disease, examples of which are as follows:

- gout and pseudogout
- hemochromatosis
- Wilson’s disease
- ochronosis (alkaptonuria)
- hemophilia and other bleeding disorders

DIAGNOSTIC STANDARD

Diagnosis by a qualified medical practitioner is required. While x-rays and other diagnostic tests such as bone scans are often helpful, the clinical characteristics must be provided. For VAC pension purposes, a disability resulting from OA is present only when there are relevant signs and/or symptoms of OA demonstrated.

Each claimed joint should be individually diagnosed, and the diagnosis for each joint should describe the site(s) affected. The term “generalized” OA may be used where five or more joints are affected by OA. For VAC pension purposes, each hand is considered one joint, and each foot is considered one joint.

ANATOMY AND PHYSIOLOGY

Joints are formed as a connection between any two bones. There are three types of joints found in the human body that vary by the amount of relative motion allowed. They are as follows:

1. **Synovial lined joints**

Synovial joints are the most common and normally provide free movement between the joints they join. Synovial joints have four distinguishing features including a joint cavity, an articular cartilage, a synovial membrane, and a fibrous capsule. The joint capsule and its associated ligaments are important in maintaining the normal relationship between the articulating bones.

There are six types of synovial joints in the body.

- 1) plane joints - permit gliding or sliding movements, e.g. vertebral facet joints.
- 2) hinge joints - permit movement in flexion and extension, e.g. humeroulnar joint of the elbow.
- 3) pivot joints - permit rotation around a longitudinal axis, e.g. atlantoaxial joint of C1-C2.
- 4) condyloid joints - permit flexion and extension, abduction and adduction, and circumduction, e.g. metacarpalphalangeal joints.
- 5) saddle joints - permit motion similar to condyloid joints, e.g. carpometacarpal joints of thumb.
- 6) ball and socket joints - permit flexion, extension, abduction, adduction, internal and external rotation as well as circumduction, e.g. shoulder joint.

2. **Synarthroses or fibrous joints**

The bones involved in these are united by fibrous tissue. The amount of movement permitted at the joint depends on the length of the fibers uniting the bones. An example would include *skull sutures* which allow little or no movement between the bones.

3. **Cartilaginous joints**

The bones involved in these joints are united by cartilage which permits slight bending especially early in life and during pregnancy. Examples would include *symphysis pubis* and *manubriosternal joint*.

The joint is a complex organ made up of periarticular and subchondral bone, articular cartilage, synovial membrane, joint capsule, and periarticular musculature.

Articular cartilage covers the ends of the bones and provides the primary load bearing functions in the joint with excellent frictional characteristics. It also provides a highly wear-resistant surface that allows one end of the joint to move efficiently over the other with little or no attrition. Most OA changes begin with focal lesions on the cartilage surface, eventually leading to the wearing away of the cartilage entirely and thereby producing OA.

Diseases of the synovial joints, such as OA or rheumatoid arthritis, are due to destruction of articular cartilage and bony changes such as osteophyte formation.

The main joints of concern with OA are synovial joints, such as the hip and the knee, which are characterized by large amounts of motion. The primary function of these joints is to facilitate the movement of various limbs and locomotion. Every movement by the human body involves synovial joints. Under normal conditions, the synovial joint is an efficient bearing system with excellent friction, lubrication, and wear properties that undergoes little or no deterioration during the life of the individual. It must be able to withstand loads of up to six times body weight on a repetitive basis, for up to one million cycles per year, depending on the specific joint and function. Wear and tear breakdown of these synovial joints leads to degenerative joint disease and arthritis, resulting in limitations in joint function and body movement.

OA may be classified as either *primary*, when there is no obvious predisposing cause, or *secondary*, when the disease results from anatomic or metabolic predisposing factors. Primary OA affects, mainly, the weight-bearing joints. Weight-bearing joints are the lumbar spine, hips, knees and ankles. In the majority of persons with OA, involvement is limited to one or only a small number of joints, e.g. the hands or the spine. Persons with involvement of numerous joint regions are considered to have a variant of OA, called *primary generalized OA*.

A number of risk factors has been implicated in the *pathogenesis of OA generally*, including but not limited to:

1. age
2. gender
3. ethnicity
4. biochemical, e.g. bone density
5. genetics
6. local biomechanical factors, e.g.
 - obesity
 - cumulative joint trauma
 - specific joint injury
 - joint deformity
 - muscle weakness
 - ligamentous laxity of joint
7. inflammation, e.g. bacterial joint infection

The following risk factors have been identified for *post-traumatic OA*:

1. high body mass
2. high level of activity
3. residual joint instability or malalignment
4. persistent articular surface incongruity

The following risk factors have been identified for *cumulative trauma-induced OA*:

1. biomechanical factors, e.g. joint malalignment, obesity
2. biochemical factors, e.g. bacterial joint infection
3. age
4. gender
5. characteristics of the playing surface
6. duration and intensity of the particular sport
7. any history of joint injury

(see also *Discussion Paper on Cumulative Joint Trauma in the Development of Osteoarthritis in the Lumbar Spine, Hips, Knees, and Ankles*).

CLINICAL FEATURES

OA is a common disease, with more than 75% of individuals over 70 years of age showing some definite radiographic evidence of OA. While the incidence of OA increases with age, the disease is not caused solely by aging of articular tissues. Joint trauma and other factors may accelerate the development of OA, and it is on these aspects that the *Pension Considerations* section is focused.

A number of factors has been implicated in the pathogenesis of OA, including but not limited to age, gender, ethnicity, biochemical (e.g. bone density), and genetics.

OA often affects the joints of the hands, including the distal interphalangeal joints, the proximal interphalangeal joints, and the carpometacarpal joint of the thumb. Other joints involved include the cervical spine, the lumbosacral spine, the hip, the knee, and the first metatarsophalangeal joint. OA is less common in the ankle, wrist, elbow and shoulder. The metacarpophalangeal joints, wrists, elbows and shoulders are rarely affected without previous trauma.

While OA is common in most populations, its clinical patterns vary with ethnic background. For example, OA of the hips is uncommon in Japan and Saudi Arabia but is prevalent in the United States. Overall, OA occurs with approximately equal frequency in men and women, although different patterns of joint involvement predominate in each gender. For example, OA of the hands and knees is more common in women, whereas OA of the hips is more common in men.

OA is a disease that begins in the articular cartilage but eventually involves the surrounding tissue, bone and synovium. When the cartilage is absent from the articular surface, the underlying bone is subjected to greater local stresses. Remodelling of the bone occurs at the joint margins through the formation of osteophytes, and can be considerable.

After the initial stages of cartilage degeneration (from many causes, including injury), there may be a delay of many years before a person feels joint pain or an x-ray shows osteoarthritic changes. Significant cartilage damage may have occurred before relevant signs and symptoms appear.

There are known inconsistencies between findings on x-rays and clinical symptoms, with only 50% to 60% of subjects with radiographic OA being clinically symptomatic. Further, an absence of x-ray evidence of OA does not exclude the presence of the disease, particularly in the early stages. Clinical symptoms, which must be recurrent or continuous after initial manifestation, may precede x-ray findings by up to approximately 10 years.

Any evaluation of x-ray findings may consider whether radiographic scoring methods were used to evaluate the radiographs, and what criteria have been used for the diagnosis and grading of OA. The American College of Rheumatology has developed criteria for x-ray classification of OA, which is widely used in diagnosis and treatment decisions. The American Medical Association (AMA) Guides to the Evaluation of Permanent Impairment, 5th edition, state:

“Certain roentgenographic findings that are of diagnostic importance, such as osteophytes and reactive sclerosis, have no direct bearing on impairment. The best roentgenographic indicator of disease stage and impairment for a person with arthritis is the cartilage interval or joint space. The hallmark of all types of arthritis is thinning of the articular cartilage; this correlates well with disease progress.”

Bearing in mind that, for VAC pension purposes, symptomatic OA is required as evidence of a “disability” resulting from OA, there are several points which should be made:

1. While the presence of osteophytes is an early indication of OA, osteophytes are not a good predictor of symptomatic OA.
2. While the presence of joint space narrowing is an indication of OA, joint space narrowing is not a good predictor of symptomatic OA.
3. Progression of OA on x-ray does not mean that there is or will be a worsening of symptomatology.

The following clinical features are often associated with OA:

- History of pain
- Impaired function
- Joint swelling

Pain is typically insidious in onset and gradually progresses, usually for many years. Flare-ups may be followed by partial or complete remission. Pain is commonly present when the joint is in motion and is relieved by rest, at least until the advanced stages of disease are reached. Joints often stiffen for short durations after periods of rest. Stiffness tends to abate after a few seconds or minutes of joint motion.

Elderly persons manifest symptoms most often; individuals younger than 40 years are rarely symptomatic.

Although the disease can progress rapidly, the course is usually slowly progressive, with gradually increasing dysfunction over many years. Fortunately, deterioration is not inevitable; symptoms may remain mild or may disappear for long periods. It is therefore difficult to determine the prognosis.

Examination of the involved joints may reveal mild tenderness, pain, restricted range of movement, joint effusions (collection of fluid in the joint), and crepitus (a grating noise on joint movement). Firm swelling (caused by underlying bony proliferation) may be seen. In advanced OA, gross deformity, bony enlargement, angulation, and marked loss of joint movement may be seen. Bony fusion is rare.

PENSION CONSIDERATIONS

A. CAUSES AND/OR AGGRAVATION

THE TIMELINES CITED BELOW ARE NOT BINDING. EACH CASE SHOULD BE ADJUDICATED ON THE EVIDENCE PROVIDED AND ITS OWN MERITS.

General:

- Each claimed joint and specific site affected by OA should be individually considered on application for pension. The term “generalized” OA may be used where five or more joints are affected by OA. For VAC pension purposes, each hand is considered one joint, and each foot is considered one joint.
- While the incidence of OA increases with age, and while a number of risk factors has been implicated in OA, including but not limited to gender and ethnicity, the following section specifies the more important factors for VAC purposes which can be identified as accelerating the development of OA.
- Where there is no evidence that risk factors, including aging, have contributed to the development of OA in any given case, no restriction on entitlement should occur.

1. Specific trauma to a joint, including Internal Derangement of the Knee, prior to clinical onset or aggravation

For specific trauma to cause or aggravate OA, the following should be evident:
Pain, swelling, or altered mobility, or any other pertinent sign or symptom, should occur in the joint within 24 hours of the injury; *and*
These acute symptoms and signs should generally last several days following their onset except where medical intervention for the trauma to that joint has occurred (“Medical intervention” includes but is not limited to physician-recommended medication; immobilization of the joint or limb by splinting, sling or similar mechanisms; injection of corticosteroids or local anesthetics into the joint; aspiration of the joint; surgery to the joint.); *and*
Signs/symptoms of OA must be present within 25 years of the specific trauma.

Specific trauma means physical injury to a joint, including a fracture involving the intra-articular surface of the joint, surgery, and penetrating injuries from projectiles such as bullets and shrapnel.

Specific trauma includes internal derangement of the knee.
Specific trauma excludes soft tissue injury (such as bursitis and tendonitis) which produces acute signs and symptoms that may last several weeks and does not result in an unstable joint.

The risk of developing OA from a single major impact to a joint depends, at least in part, on the size and depth of the injury. Injury which directly damages articular cartilage and underlying subchondral bone is strongly associated with OA. Injury of supporting structures, e.g. ligaments and tendons, may accelerate the development of OA in weight-bearing joints if the injury has resulted in an unstable joint.

2. Cumulative joint trauma, as defined by VAC, prior to clinical onset or aggravation: LUMBAR SPINE, HIP, KNEE, ANKLE OA only

See Appendix A, attached, and Discussion Paper on Cumulative Joint Trauma in the Development of Osteoarthritis of the Lumbar Spine, Hips, Knees and Ankles.

3. Obesity

*Obesity is considered a risk factor in **causation of OA for the following sites:***

- knee - for unilateral or bilateral knee OA
- hip - for bilateral hip OA only

There is insufficient evidence at this time to support obesity in causation of OA lumbar spine.

*Obesity is considered a risk factor in **aggravation of OA for the following sites:***

- knee- for unilateral or bilateral knee OA
- hip - for bilateral hip OA only
- lumbar spine

For obesity to cause or aggravate OA of the knee(s), hips or lumbar spine, the following should be evident:

Obesity should have produced a significant weight gain, of the order of a 20% increase in baseline weight; *and*

Obesity should be associated with a BMI of 30 or greater; *and*

Obesity should have been present for at least 10 continuous years prior to clinical onset or aggravation.

For VAC purposes, obesity is a body mass index (BMI) of 30 or greater. The BMI table is contained in the Gastrointestinal Chapter of the Table of Disabilities.

BMI = weight in kgs

height in metres squared

Obesity is defined as an increase in body weight by way of fat accumulation.

The definition excludes weight gain resulting from:

- edema
- peritoneal or pleural effusion
- muscle hypertrophy

4. Vibration prior to clinical onset or aggravation: WRISTS, ELBOWS, HANDS only

For vibration to cause or aggravate OA of the wrists, elbows, or hands, the following criteria should be met:

Vibration should occur for at least 1 hour per day, on 51% of days worked, for at least 10 years; and

Signs and/or symptoms of OA should occur during the activity producing the vibration, or within 25 years of the activity ceasing.

Vibration is considered a risk factor for OA in the following sites:

- wrists
- elbows
- hands

Vibration can occur from a number of tools, including pneumatic tools and other mechanized tools, such as a chain saw.

A pneumatic tool is any tool driven by compressed air, including but not limited to jack hammers, pneumatic drills, compactors, large pop rivet guns of the type used on construction sites, sand blasting equipment, and spray painting equipment.

5. Permanent ligamentous instability of a joint confirmed by medical examination prior to clinical onset or aggravation

Permanent ligamentous instability is a continuing or recurring abnormal mobility and instability of a joint, in which the ligaments are overstretched and become loose, and the joint, in turn, becomes abnormally mobile and unstable. It may be due to several causes, including specific trauma.

Permanent ligamentous instability should be demonstrated on medical examination.

6. Malalignment of a joint prior to clinical onset or aggravation

Malalignment means the presence of significant joint displacement resulting from the effect of underlying muscle weakness, deformity of other joints, a mild joint dysplasia, anatomical variances such as varus and valgus deformities of the knee, and structural leg length inequality as defined by VAC (see entitlement guideline on Leg Length Inequality).

For malalignment of a joint to cause or aggravate OA, malalignment should be present for a period of at least 5 years.

7. Leg length inequality, as defined by VAC, prior to clinical onset or aggravation: other than Leg length inequality producing malalignment (see Pension Consideration # 6 on Malalignment)

See Discussion Paper on Leg Length Inequality.

8. A neurotrophic arthropathy (Charcot joints) of the joint prior to clinical onset or aggravation

A neurotropic arthropathy is a neurologic disorder that causes a loss of sensory nerve functions. It is sometimes accompanied by destructive arthropathy similar to OA. The lack of normal joint sensation in itself is not sufficient to result in neurotropic arthropathy. Examples of neurotropic arthropathy include:

- *tapes dorsalis*
- *neuropathy in diabetes mellitus*
- *syringomyelia*
- *demyelinating disease*
- *meningomyelocele*

9. Aseptic necrosis of the joint prior to clinical onset or aggravation

10. Paget's disease of the joint prior to clinical onset or aggravation

11. Inability to obtain appropriate clinical management

Exclusions:

Despite research efforts to date, there is a lack of sufficient evidence at this time to establish for pension purposes a relationship between OA and the following:

- *intra-articular corticosteroid injections*
- *harsh conditions, e.g. extremes in temperature, sleeping on the ground, excessive dryness or dampness.*

B. MEDICAL CONDITIONS WHICH ARE TO BE INCLUDED IN ENTITLEMENT/ASSESSMENT

Osteoarthritis includes all soft tissue and joint disorders in the area of the affected joint. Examples include, but are not limited to the following:

1. OA of the glenohumeral joint of the shoulder:
 - adhesive capsulitis
 - rotator cuff syndrome
 - subacromial impingement syndrome
 - calcific tendinitis
 - supraspinatus tendonitis
 - subacromial bursitis
2. OA of the cervical spine:
 - degenerative disc disease of cervical spine
 - spondylosis of cervical spine
 - mechanical cervical pain
 - chronic cervical sprain/strain
 - chronic whiplash syndrome
3. OA of the thoracic spine:
 - degenerative disc disease of thoracic spine
 - spondylosis of thoracic spine
 - mechanical thoracic pain
 - chronic thoracic sprain/strain
4. OA of the lumbar spine:
 - degenerative disc disease of lumbar spine
 - spondylosis of lumbar spine
 - mechanical low back pain
 - chronic lumbar sprain/strain
5. OA of the hip:
 - trochanteric bursitis
6. OA of the knee (tibial femoral OA):
 - chondromalacia patellae
 - patello-femoral syndrome
 - internal derangement of the knee
 - patellofemoral OA
 - prepatellar bursitis
 - suprapatellar bursitis
 - medial and lateral collateral ligamentous sprain

7. OA of the ankle:
 - chronic ankle sprain
 - calcaneal bursitis
 - Achilles tendonitis
8. OA of the wrist:
9. OA of all fingers and thumbs:
10. OA of the elbow:
 - chronic olecranon bursitis
 - chronic medial epicondylitis
 - chronic lateral epicondylitis
 - exostosis of olecranon

**C. COMMON MEDICAL CONDITIONS WHICH MAY RESULT FROM
OSTEOARTHROSIS/OSTEOARTHRITIS AND/OR ITS TREATMENT**

APPENDIX A

Cumulative Joint Trauma in the development of OA of the Lumbar Spine, Hips, Knees and Ankles.

RECOMMENDATIONS FOR VAC PENSION PURPOSES

Please note :

OA can be diagnosed by symptoms or pathology. For VAC purposes, the “disability” of OA is defined by the existence of relevant signs and/or symptoms; x-ray evidence alone is insufficient.

There are several risk factors for OA which have been identified in the literature. For the purposes of this paper, however, only the following risk factors, as defined in the following *Definitions* subsections, are considered in the relationship between cumulative joint trauma and OA:

- obesity;
- an anatomically abnormal joint;
- a joint that has been affected by specific trauma

The recommendations should be read in conjunction with the entitlement guideline on Osteoarthrosis/Osteoarthritis.

The timeframes required to cause, accelerate or aggravate OA may be shorter if a combination of factors exists.

LUMBAR SPINE:

Definitions:

- *Cumulative joint trauma associated with occupations* means manual lifting or carrying of loads of at least 25 kg with occasional manual lifting or carrying of loads of at least 35 kg; **or** manual pushing or pulling of loads of at least 25 kg with occasional manual pushing or pulling of loads of at least 35 kg.
- *Normal spine* means a spine that is not *anatomically abnormal* or a spine that has not been subject of *specific trauma*, as defined below.
- *Anatomically abnormal lumbar spine* means a lumbar spine that is affected by underlying muscle weakness or imbalances, neurologic abnormalities, or anatomic variations (such as spondylolisthesis of the lumbar spine).
- *Specific trauma* means significant physical injury to a joint, including a fracture involving the intra-articular surface of the joint, surgery, and penetrating injuries from projectiles.
- *Obesity* may aggravate lumbar spine OA.

Obesity means a significant increase in body weight by way of fat accumulation (of the order of a 20% increase in baseline weight), with a BMI of 30 or greater, which have been present for at least 10 continuous years.

$$\text{BMI} = \frac{\text{weight in kgs}}{\text{height in metres squared}}$$

This definition excludes weight gain resulting from edema, peritoneal or pleural effusion, or muscle hypertrophy.

CAUSATION:

1. Cumulative joint trauma associated with occupations in an individual with a normal lumbar spine

For cumulative joint trauma associated with occupations to cause OA in an individual with a normal lumbar spine, the following criteria should be met:

Cumulative joint trauma associated with occupations should take place for at least 2 hours per day, on at least 51% of days worked, for a period of at least 10 years; *and*

Signs/symptoms of OA should be present in the affected part of the lumbar spine during this timeframe or within 25 years after the activity ceases.

2. Cumulative joint trauma associated with occupations in an individual with an anatomically abnormal lumbar spine **or** in an individual with a lumbar spine that has previously sustained specific trauma

*For cumulative joint trauma associated with occupations to contribute to OA in an individual with an anatomically abnormal lumbar spine **or** in an individual with a lumbar spine that has previously sustained specific trauma, the following criteria should be met:*

Cumulative joint trauma associated with occupations should take place for at least 2 hours per day, on at least 51% of days worked, for a period of at least 5 years; *and*

Signs/symptoms of OA should be present in the affected part of the lumbar spine during this timeframe or within 25 years after the activity ceases.

AGGRAVATION:

1. Cumulative joint trauma associated with occupations in a non-obese individual in the aggravation of pre-existing lumbar spine OA

For cumulative joint trauma associated with occupations in a non-obese individual to aggravate OA lumbar spine, the following criteria should be met:

Increased signs/symptoms of OA develop during the activity, or within 30 days of stopping the activity; *and*

Increased signs/symptoms of OA last for a period of at least 6 months, on a continuous or recurrent basis, whether or not the activity has stopped.

2. Obesity may be a factor in aggravation of lumbar spine OA when the criteria set out in the Definitions subsection are met.

Exclusions:

The following activities are not considered activities which would cause OA in a normal lumbar spine or aggravate OA lumbar spine:

- running that is not of high intensity or high mileage
- stairclimbing*
- walking on uneven ground*

*The level and intensity of the noted activities are what is anticipated to occur on an informal basis in daily life.

HIPS:**Definitions:**

- *Cumulative joint trauma associated with occupations* means kneeling or squatting in combination with carrying of loads of at least 35 kg on most days, **or** lifting of 35 kg loads in a twisted or bent position.
- *Cumulative joint trauma associated with sports and/or exercise activities* means high-intensity, acute, direct joint impact as a result of contact with other participants, playing surfaces, or equipment; **or** repetitive joint impact with torsional loading (twisting); **or** running of high intensity and high mileage, as in marathon running or training.
- *Normal hip* means a hip that is not *anatomically abnormal* or a hip that has not been subject of *specific trauma*, as defined below.
- *Anatomically abnormal hip* means a hip that is affected by underlying muscle weakness or imbalances, neurologic abnormalities, or anatomic variations (such as valgus deformity of the hips, or a mild joint dysplasia).

- *Specific trauma* means significant physical injury to a joint, including a fracture involving the intra-articular surface of the joint, surgery, and penetrating injuries from projectiles.
- Obesity may cause or aggravate bilateral hip OA.
Obesity means a significant increase in body weight by way of fat accumulation (of the order of a 20% increase in baseline weight), with a body mass index (BMI) of 30 or greater, which have been present for at least 10 continuous years.
$$\text{BMI} = \frac{\text{weight in kgs}}{\text{height in metres squared}}$$

This definition excludes weight gain resulting from edema, peritoneal or pleural effusion, or muscle hypertrophy.

CAUSATION:

1. Cumulative joint trauma associated with occupations in a non-obese individual with a normal hip

For cumulative joint trauma associated with occupations to cause OA in a normal hip in a non-obese individual, the following criteria should be met:

Cumulative joint trauma associated with occupations should take place for at least 2 hours per day, on at least 51% of days worked, for a period of at least 10 years; *and*

Signs/symptoms of OA should be present in the affected part of the hip during this timeframe or within 25 years after the activity ceases.

2. Cumulative joint trauma associated with occupations in an obese individual

For cumulative joint trauma associated with occupations to contribute to OA of the hips in an obese individual, the following criteria should be met:

Bilateral hip OA must have developed; *and*

Cumulative joint trauma associated with occupations should have taken place for at least 2 hours per day, on at least 51% of days worked, for a period of at least 5 years; *and*

Signs/symptoms of OA should have been present in the hip joints during this timeframe or within 25 years after the activity ceased.

3. Cumulative joint trauma associated with occupations in an individual with an anatomically abnormal hip **or** in an individual with a hip that has previously sustained specific trauma

*For cumulative joint trauma associated with occupations to contribute to OA of the hip in an individual with an anatomically abnormal hip **or** in an individual with a hip that has previously sustained specific trauma, the following criteria should be met:*

Cumulative joint trauma associated with occupations should take place for at least 2 hours per day, on at least 51% of days worked, for a period of at least 5 years; *and*

Signs/symptoms of OA should be present in the hip joint during this timeframe or within 25 years after the activity ceases.

4. Cumulative joint trauma associated with sports and/or exercise activities in a non-obese individual with a normal hip

For cumulative joint trauma associated with sports and/or exercise activities to cause OA in a normal hip in a non-obese individual, the following criteria should be met:

Cumulative joint trauma associated with sports and/or exercise activities should take place for a total of at least 5 hours per week for a period of at least 10 years; *and*

Signs/symptoms of OA should be present in the hip joint during this timeframe or within 25 years after the activity ceases.

5. Cumulative joint trauma associated with sports and/or exercise activities in an obese individual

For cumulative joint trauma associated with sports and/or exercise activities to contribute to OA of the hips in an obese individual, the following criteria should be met:

Bilateral hip OA must have developed; *and*

Cumulative joint trauma associated with sports and/or exercise activities should have taken place for a total of at least 5 hours per week for a period of at least 5 years; *and*

Signs/symptoms of OA should have been present in the hip joints during this timeframe or within 25 years after the activity ceased.

6. Cumulative joint trauma associated with sports and/or exercise activities in an individual with an anatomically abnormal hip **or** in an individual with a hip that has previously sustained specific trauma

*For cumulative joint trauma associated with occupations to contribute to OA of the hip in an individual with an anatomically abnormal hip **or** in an individual with a hip that has previously sustained specific trauma, the following criteria should be met:*

Cumulative joint trauma associated with sports and/or exercise activities should take place for a total of 5 hours per week for a period of at least 5 years; *and*

Signs/symptoms of OA should be present in the hip joint during this timeframe or within 25 years after the activity ceases.

AGGRAVATION:

1. Cumulative joint trauma associated with occupations in a non-obese individual in the aggravation of pre-existing hip OA

For cumulative joint trauma associated with occupations in a non-obese individual to aggravate hip OA, the following criteria should be met;

Increased signs/symptoms of OA develop during the activity, or within 30 days of stopping the activity; and

Increased signs/symptoms of OA last for a period of at least 6 months, on a continuous or recurrent basis, whether or not the activity has stopped.

2. Cumulative joint trauma associated with sports and/or exercise activities in a non-obese individual in the aggravation of pre-existing hip OA

For cumulative joint trauma associated with sports and/or activities in a non-obese individual to aggravate hip OA, the following criteria should be met;

Increased signs/symptoms of OA develop during the activity, or within 30 days of stopping the activity; and

Increased signs/symptoms of OA last for a period of at least 6 months, on a continuous or recurrent basis, whether or not the activity has stopped.

3. Obesity may be a factor in aggravation of bilateral hip OA when the criteria set out in the Definitions subsection are met.

Exclusions:

The following activities are not considered activities which would cause OA in a normal hip joint, or aggravate hip OA:

- running that is not of high intensity or high mileage
- stairclimbing*
- walking on uneven ground*

*The level and intensity of the noted activities are what is anticipated to occur on an informal basis in daily life.

KNEES:**Definitions:**

- *Cumulative joint trauma associated with occupations* means kneeling or squatting in combination with carrying of loads of at least 35 kg on most days, **or** lifting of 35 kg loads in a twisted or bent position.
- *Cumulative joint trauma associated with sports and/or exercise activities* means high-intensity, acute, direct joint impact as a result of contact with other

participants, playing surfaces, or equipment; **or** repetitive joint impact with torsional loading (twisting); **or** running of high intensity and high mileage, such as in marathon running or training.

- *Normal knee* means a knee that is not *anatomically abnormal* or a knee that has not been subject of *specific trauma*, as defined below.
- *Anatomically abnormal knee* means a knee that is affected by underlying muscle weakness or imbalances, neurologic abnormalities, or anatomic variations (such as valgus or varus deformity of the knee, or a mild joint dysplasia).
- *Specific trauma* means significant physical injury to a joint, including a fracture involving the intra-articular surface of the joint, surgery, and penetrating injuries from projectiles.
- *Obesity* may cause or aggravate unilateral or bilateral OA of the knee. *Obesity* means a significant increase in body weight by way of fat accumulation (of the order of a 20% increase in baseline weight), with a body mass index (BMI) of 30 or greater, which have been present for at least 10 continuous years.
$$\text{BMI} = \frac{\text{weight in kgs}}{\text{height in metres squared}}$$

This definition excludes weight gain resulting from edema, peritoneal or pleural effusion, or muscle hypertrophy.

CAUSATION:

1. Cumulative joint trauma associated with occupations in an individual with a normal knee

For cumulative joint trauma associated with occupations to cause OA in a normal knee in a non-obese individual, the following criteria should be met:

Cumulative joint trauma associated with occupations should take place for at least 2 hours per day, on at least 51% of days worked, for a period of at least 10 years; and

Signs/symptoms of OA should be present in the knee joint during this timeframe or within 25 years after the activity ceases.

2. Cumulative joint trauma associated with occupations in an obese individual **or** in an individual with an anatomically abnormal knee **or** in an individual with a knee that has previously sustained specific trauma

*For cumulative joint trauma associated with occupations to contribute to OA of the knee in an obese individual, **or** in an individual with an anatomically abnormal knee, **or** in an individual with a knee that has previously sustained specific trauma, the following criteria should be met:*

Cumulative joint trauma associated with occupations should take place for at least 2 hours per day, on at least 51% of days worked, for a period of at least 5 years; *and*

Signs/symptoms of OA should be present in the knee joint during this timeframe or within 25 years after the activity ceases.

3. Cumulative joint trauma associated with sports and/or exercise activities in a non-obese individual with a normal knee

For cumulative joint trauma associated with sports and/or exercise activities to cause OA in a normal knee in a non-obese individual, the following criteria should be met:

Cumulative joint trauma associated with sports and/or exercise activities should take place for a total of at least 5 hours per week for a period of at least 10 years; *and*

Signs/symptoms of OA should be present in the knee joint during this timeframe or within 25 years after the activity ceases.

4. Cumulative joint trauma associated with sports and/or exercise activities in an obese individual **or** in an individual with an anatomically abnormal knee **or** in an individual with a knee that has previously sustained specific trauma

*For cumulative joint trauma associated with occupations to contribute to OA of the knee in an obese individual, **or** in an individual with an anatomically abnormal knee, **or** in an individual with a knee that has previously sustained specific trauma, the following criteria should be met:*

Cumulative joint trauma associated with sports and/or exercise activities should take place for a total of at least 5 hours per week for a period of at least 5 years; *and*

Signs/symptoms of OA should be present in the knee joint during this timeframe or within 25 years after the activity ceases.

AGGRAVATION:

1. Cumulative joint trauma associated with occupations in a non-obese individual in the aggravation of pre-existing knee OA

For cumulative joint trauma associated with occupations in a non-obese individual to aggravate knee OA, the following criteria should be met:

Increased signs/symptoms of OA develop during the activity, or within 30 days of stopping the activity; *and*

Increased signs/symptoms of OA last for a period of at least 6 months, on a continuous or recurrent basis, whether or not the activity has stopped.

2. Cumulative joint trauma associated with sports and/or exercise activities in a non-obese individual in the aggravation of pre-existing knee OA

For cumulative joint trauma associated with sports and/or exercise activities in a non-obese individual to aggravate knee OA, the following criteria should be met:

Increased signs/symptoms of OA develop during the activity, or within 30 days of stopping the activity; *and*
Increased signs/symptoms of OA last for a period of at least 6 months, on a continuous or recurrent basis, whether or not the activity has stopped.

3. Obesity may be a factor in aggravation of unilateral or bilateral knee OA when the criteria set out in the Definitions subsection are met.

Exclusions:

The following activities are not considered activities which would cause OA in a normal knee joint, or aggravate knee OA:

- running that is not of high intensity or high mileage
- stairclimbing*
- walking on uneven ground*

*The level and intensity of the noted activities are what is anticipated to occur on an informal basis in daily life.

ANKLES:

Definitions:

- *Cumulative joint trauma associated with occupations* means kneeling or squatting in combination with carrying of loads of at least 35 kg on most days, **or** lifting of 35 kg loads in a twisted or bent position.
- *Normal ankle* means an ankle that is not *anatomically abnormal* or an ankle that has not been subject of *specific trauma*, as defined below.
- *Anatomically abnormal ankle* means an ankle affected by underlying muscle weakness or imbalances, neurologic abnormalities, or anatomic variations (such as valgus or varus deformity of the ankle, or a mild joint dysplasia).
- *Specific trauma* means significant physical injury to a joint, including a fracture involving the intra-articular surface of the joint, surgery, and penetrating injuries from projectiles.

CAUSATION:

1. Cumulative joint trauma associated with occupations in an individual with a normal ankle

For cumulative joint trauma associated with occupations to cause OA in a normal ankle, the following criteria should be met:

Cumulative joint trauma associated with occupations should take place for at least 2 hours per day, on at least 51% of days worked, for a period of at least 10 years; *and*

Signs/symptoms of OA should be present in the ankle joint during this timeframe or within 25 years after the activity ceases.

2. Cumulative joint trauma associated with occupations in an individual with an anatomically abnormal ankle **or** in an individual with a ankle that has previously sustained specific trauma

*For cumulative joint trauma associated with occupations to contribute to OA of the ankle in an individual with an anatomically abnormal ankle **or** in an individual with an ankle that has previously sustained specific trauma, the following criteria should be met:*

Cumulative joint trauma associated with occupations should take place for at least 2 hours per day, on at least 51% of days worked, for a period of at least 5 years; *and*

Signs/symptoms of OA should be present in the ankle joint during this timeframe or within 25 years after the activity ceases.

AGGRAVATION:

1. Cumulative joint trauma associated with occupations in the aggravation of pre-existing ankle OA

For cumulative joint trauma associated with occupations to aggravate ankle OA, the following criteria should be met:

Increased signs/symptoms of OA develop during the activity, or within 30 days of stopping the activity; *and*

Increased signs/symptoms of OA last for a period of at least 6 months, on a continuous or recurrent basis, whether or not the activity has stopped.

Exclusions:

Obesity is **not** considered a risk factor in ankle OA

The following activities are not considered activities which would cause OA in a normal ankle joint, or aggravate ankle OA:

- running that is not of high intensity or high mileage
- stairclimbing*
- walking on uneven ground*

*The level and intensity of the noted activities are what is anticipated to occur on an informal basis in daily life.

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