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PRESENTATION BREAKDOWN



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Introduction

Osteoarthritis of the Knee

UK Knee Osteoarthritis Prevalence

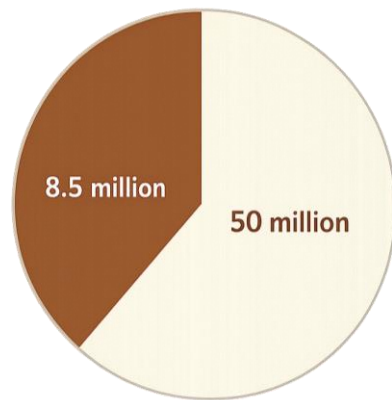


Figure 1. UK Knee Osteoarthritis Prevalence — showing 8.5 million people affected compared to the total UK adult population (Versus Arthritis, 2023).

- ❖ Osteoarthritis (OA) of the knee is highly prevalent in the UK, affecting over 8.5 million people and causing significant pain and reduced mobility (Versus Arthritis, 2023).
- ❖ Globally, OA is a major contributor to long-term disability and reduced functional independence (WHO, 2023; Cross et al., 2014).
- ❖ OA is a progressive degenerative joint disease involving cartilage breakdown, subchondral bone sclerosis, osteophyte formation, and synovial inflammation (Hunter and Bierma-Zeinstra, 2019).
- ❖ Modern evidence shows OA is a whole-joint condition influenced by mechanical loading, biochemical changes, inflammation, and altered pain signalling (Felson, 2020; Scanlon and Sanders, 2018).
- ❖ Symptoms such as pain, stiffness, swelling, and reduced mobility result from interactions between musculoskeletal changes and neural pain processing.

Anatomy and Physiology of the Musculoskeletal System: The Knee Joint

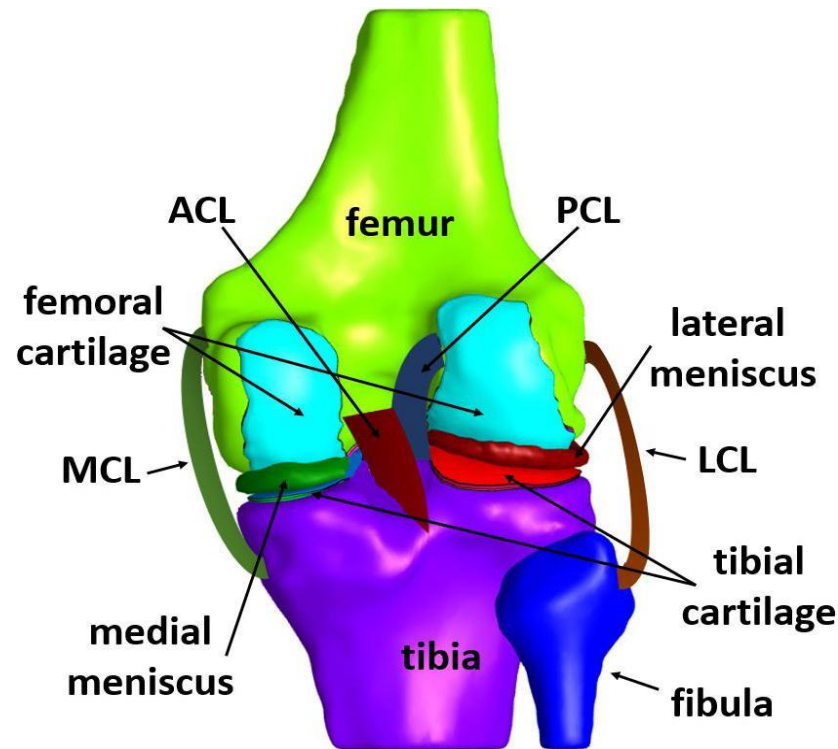


Figure 2. Anatomy of the Knee Joint.

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- ❖ **Musculoskeletal system** — provides structure and movement; the knee is a synovial hinge joint formed by the distal femur, proximal tibia, and posterior patella, enabling weight-bearing activities such as walking and stair climbing (Tortora and Derrickson, 2017).
- ❖ **Articular cartilage** — hyaline cartilage on the femur and tibia reduces friction and supports efficient joint motion (Waugh and Grant, 2018; Marieb and Hoehn, 2018).
- ❖ **Menisci** — the medial and lateral menisci are fibrocartilage pads that enhance joint congruence, improve stability, and absorb mechanical stress (Hunter and Bierma-Zeinstra, 2019).



Anatomy of the Knee Joint



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Stability and Movement

- ❖ **Ligaments maintain stability** — ACL prevents anterior tibial translation, PCL prevents posterior translation, MCL resists valgus forces, and LCL resists varus forces.
- ❖ **Muscles support movement** — quadriceps and hamstrings control knee flexion and extension and help maintain joint alignment.
- ❖ **Synovial membrane** — produces synovial fluid that lubricates and nourishes cartilage (Sturgeon, 2018).
- ❖ **Functional integration** — together, these structures allow the knee to function efficiently under significant mechanical load.



Application of Disease to the Musculoskeletal System

- ❖ **Cartilage degeneration increases friction** — articular cartilage becomes thin and rough, reducing shock absorption (Scanlon and Sanders, 2018; Hunter and Bierma-Zeinstra, 2019).
- ❖ **Subchondral bone sclerosis and osteophytes** — bone thickens and forms osteophytes, causing pain and stiffness (Versus Arthritis, 2023; Cross et al., 2014).
- ❖ **Meniscal weakening reduces stability** — medial and lateral menisci may weaken or tear, reducing load distribution (Waugh and Grant, 2018).
- ❖ **Synovial inflammation increases swelling** — inflamed synovium produces excess fluid, leading to swelling (Sturgeon, 2018).
- ❖ **Muscle weakness from pain-related inactivity** — reduced activity weakens quadriceps, causing instability (Felson, 2020).
- ❖ **Joint space narrowing on imaging** — radiographs show narrowing due to cartilage loss (NICE, 2022).

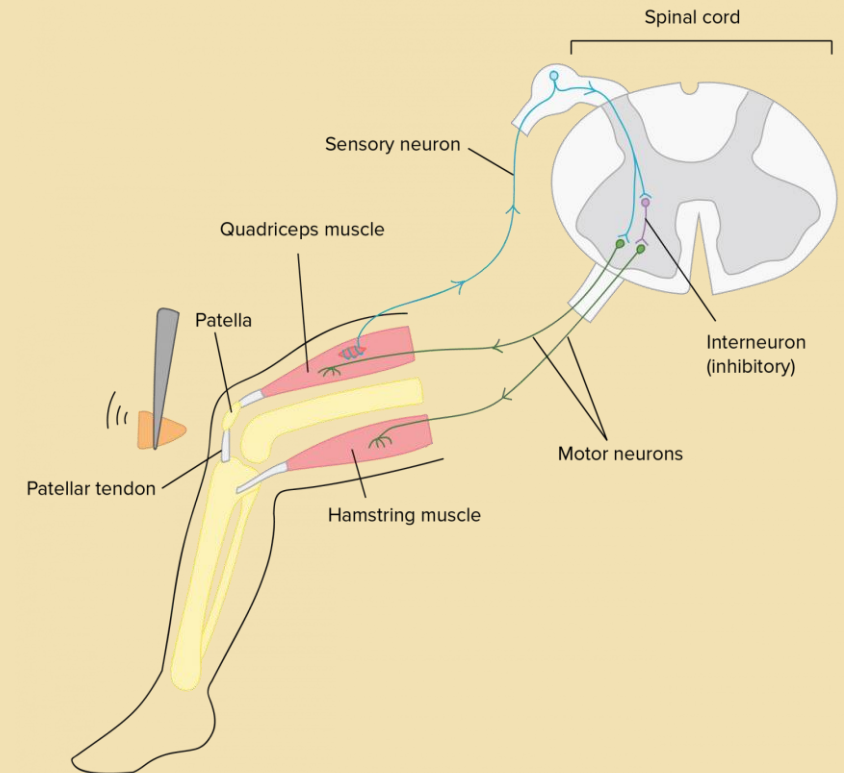


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Application of Disease to the Nervous System

- ❖ **Nociceptor activation increases pain signalling** — exposed bone and deteriorating cartilage trigger nociceptors, sending pain signals to the spinal cord and brain (Sturgeon, 2018; Nair and Peate, 2011).
- ❖ **Cytokines sensitise nerve endings** — synovial inflammation releases cytokines that heighten nerve sensitivity (Hunter and Bierma-Zeinstra, 2019).
- ❖ **Osteophytes irritate tissues** — bony growths stimulate nociceptors and increase discomfort.
- ❖ **Central sensitisation increases hypersensitivity** — persistent pain can make the nervous system overly reactive (Felson, 2020).
- ❖ **Pain inhibits quadriceps activation** — reduced muscle activation leads to weakness, instability, and higher fall risk (Scanlon and Sanders, 2018).
- ❖ **Neural changes worsen mobility** — altered pain processing contributes to functional decline.



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Interaction Between the Musculoskeletal and Nervous Systems in Knee OA

- ❖ **Cartilage loss activates nociceptors** — exposed bone stimulates pain receptors (Sturgeon, 2018; Nair and Peate, 2011).
- ❖ **Synovial inflammation sensitises nerves** — cytokines increase neural sensitivity (Hunter and Bierma-Zeinstra, 2019).
- ❖ **Osteophytes irritate tissues** — bony growths trigger additional nociceptor activation (Cross et al., 2014).
- ❖ **Persistent pain causes central sensitisation** — the nervous system becomes hypersensitive (Felson, 2020).
- ❖ **Pain reduces quadriceps activation** — muscle inhibition leads to instability and reduced mobility (Scanlon and Sanders, 2018).



Fictional Patient Profile



Mrs J

- ❖ **62-year-old woman in Birmingham** — part-time supermarket assistant; prolonged standing increases knee load.
- ❖ **BMI 31 kg/m²** — classified as obese; contributes to joint loading and inflammation (Felson, 2020).
- ❖ **Sedentary lifestyle** — former smoker; limited physical activity.
- ❖ **Typical OA symptoms** — worsening knee pain, <30 min morning stiffness, difficulty climbing stairs, reduced walking distance.
- ❖ **Frequent paracetamol use** — self-management of pain.
- ❖ **OA criteria** — described by NICE and aligned with characteristic features (NICE, 2022).



Personal Care Plan (PCP)

 **Aim of the care plan** — reduce pain, improve mobility, enhance joint stability, and support independence (NICE, 2022).

 **Patient education** — OA involves joint damage and repair; physical activity is essential for symptom management.

 **Exercise therapy** — quadriceps/hamstring strengthening, low-impact aerobic exercise (swimming, cycling), and balance training to reduce falls risk (NICE, 2022; Cross et al., 2014).

 **Weight management** — dietitian referral supports gradual weight loss, reducing mechanical load and inflammation (Hunter and Bierma-Zeinstra, 2019).

 **Stepwise pain management** — topical NSAIDs and paracetamol; oral NSAIDs with gastroprotection if needed; avoid long-term opioids (BMJ, 2023).

 **Assistive devices** — knee brace or walking stick to improve stability; stick used on the opposite side of the affected knee.

 **Regular monitoring** — review pain, mobility, BMI, and medication use.

 **Multidisciplinary support** — GP, physiotherapist, and dietitian involvement.



Risk Factors

- ❖ **Age-related cartilage decline** — ageing reduces cartilage resilience and increases OA risk (Waugh and Grant, 2018).
- ❖ **Gender differences** — women have higher OA prevalence post-menopause due to hormonal changes (Waugh and Grant, 2018).
- ❖ **Obesity and inflammation** — BMI 31 kg/m² increases mechanical load and adipose-driven cytokine inflammation (Felson, 2020).
- ❖ **Occupational strain** — prolonged standing and repetitive lifting increase joint stress.
- ❖ **Previous knee injuries** — past trauma accelerates cartilage degeneration (Versus Arthritis, 2023).
- ❖ **Sedentary behaviour** — low activity weakens supporting muscles and reduces joint stability.
- ❖ **Genetic predisposition** — family history increases OA susceptibility (Cross et al., 2014).

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Evidence-Based Recommendations

 **Exercise therapy** — improves muscle strength, joint stability, and functional ability (NICE, 2022; Hunter and Bierma-Zeinstra, 2019).

 **Weight management** — reduces mechanical load and inflammation; dietitian referral recommended.

 **Patient education** — understanding OA and the role of physical activity improves self-management.

 **Pharmacological options** — topical NSAIDs preferred; oral NSAIDs used cautiously with gastroprotection; avoid long-term opioids (British Medical Journal, 2023).

 **Assistive devices** — walking sticks, braces, and appropriate footwear support mobility and reduce pain.

 **Regular review** — ensures interventions remain effective and prevents functional decline (NICE, 2022).

 **Evidence-aligned care** — interventions backed by research and national guidelines.



Ethical Considerations and NICE



Non-maleficence — avoid harm by limiting unnecessary long-term opioid use; protects Mrs J from medication-related risks (British Medical Journal, 2023).



Confidentiality — protect Mrs J's identity and maintain privacy when discussing her BMI, pain levels, and medication use.



Autonomy — shared decision-making ensures Mrs J chooses interventions that match her preferences and goals.



Beneficence — provide evidence-based care that promotes Mrs J's wellbeing and supports her independence.



Justice — ensure Mrs J receives equal access to physiotherapy, dietetic support, and pain management.



Cultural sensitivity — support respectful communication and personalised planning that reflects Mrs J's background and daily routines (Sturgeon, 2018).



NICE alignment — ethical principles underpin safe, fair, person-centred care throughout Mrs J's plan (NICE, 2022).



Conclusion



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Knee osteoarthritis is a complex condition involving degeneration of musculoskeletal structures and altered nervous system signalling. Understanding both systems is essential for accurate assessment and effective care planning. Evidence-based interventions such as exercise therapy, weight management, analgesia, and patient education can significantly improve symptoms and quality of life. Routine data, including pain scores, BMI, mobility assessments, and medication reviews, supports ongoing monitoring and personalised care. A holistic, multidisciplinary approach ensures safe, effective, and person-centred care.



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