[1] Centre for Musculoskeletal Health Research, School of Medicine, Keele University, Staffordshire, UK

[2] Research User Group, Primary Care Centre Versus Arthritis, School of Medicine, Keele University, Staffordshire, UK (patient author)

[3] Haywood Academic Rheumatology Centre, Midlands Partnership University NHS Foundation Trust, Haywood Hospital, Staffordshire, UK

Correspondence to: E Parry
e.parry@keele.ac.uk

Cite this as: *BMJ* 2023;383:e076455
http://dx.doi.org/10.1136/bmj-2023-076455
Published: 09 October 2023

PRACTICE POINTER

Recognising and managing osteoarthritis flares in primary care

Emma Parry, [1] Christine Walker, [2] Martin J Thomas[1, 3]

What you need to know

- Osteoarthritis flares are sudden sustained increases in pain, swelling, and stiffness for at least 24 hours, worse than usual patterns, which may affect sleep and daily activities, and can lead to emotional exhaustion
- Flares usually last three to eight days, and may resolve spontaneously or result in the need to take extra analgesia
- Joints giving way and lack of muscle strength, some physical activities, low mood, poor sleep, and changes in ambient temperature may trigger flares
- Discuss long term management with people experiencing osteoarthritis flares; this should include physical activity, exercise, and weight management if relevant, fast-response management for sudden-onset flares (eg, rationalised use of medication and short term relative rest), and consideration of personal flare triggers

A 52 year old woman who was diagnosed with knee osteoarthritis two years ago consults her general practitioner with a six day history of sudden-onset increase in right knee pain, morning stiffness, swelling, waking at night because of her symptoms, and difficulty with going up stairs. She has been resting more and taking ibuprofen for pain relief. She has experienced several similar episodes over the past few months, each lasting between a couple of days and a week. Although her symptoms are now slightly improving she would like to know how she should manage future flares.

Osteoarthritis is a chronic long term condition that typically affects the whole joint complex, leading to pain, stiffness, and loss of function.[1] The 2022 osteoarthritis guidelines published by the UK National Institute for Health and Care Excellence (NICE) recognise the absence of evidence regarding osteoarthritis flares and their management.[2] Similarly, international guidelines do not discuss flares comprehensively, and usually do so only in relation to management with intra-articular corticosteroid injections.[3-5]

In this article, we discuss how conversations in primary care consultations can be framed to help people with osteoarthritis consider and understand their own flares. The current evidence base principally supports flares related to knee and hip osteoarthritis. Evidence for management of flares in other joints, such as the hand, is lacking, but many of the key principles presented in this article can be applied to other joints. Information in this article should be considered only once differential diagnoses of osteoarthritis, and red flags such as tumour, trauma, or infection, have been excluded.

What are osteoarthritis flares?

Osteoarthritis is a leading cause of global disability, and affected about 595 million people in 2020.[6] This represents a prevalence change increase of 132.2% since 1990, partly owing to a growth in ageing populations and rising levels of obesity worldwide.[1 6] Consequently, osteoarthritis flares are likely to be encountered more in clinical practice. No accurate estimate is available for the proportion of people with osteoarthritis who experience flares; however, in studies of community dwelling adults with, or at risk of, knee osteoarthritis in England, significant pain variability or flares were observed in 23-66% of participants.[7-9] Flares can therefore be identified as intermittent "acute-on-chronic" condition events.[9]

Flare definitions for use in widespread clinical practice remain untested, as defining flares is a relatively new concept. One working definition is: "a transient state, different from the usual state of the condition, with a duration of a few days, characterised by onset, worsening of pain, swelling, stiffness, impact on sleep, activity, functioning, and psychological aspects that can resolve spontaneously or lead to a need to adjust therapy."[10] Achieved through international consensus, and endorsed by people living with osteoarthritis as part of the Outcome Measures in Rheumatology Flares in Knee and Hip Osteoarthritis Working Group, this definition is primarily used for research purposes.[10-12] The 2022 UK NICE osteoarthritis guidelines define flares similarly, further specifying duration where episodes lead to a change in therapy for ≥24 hours.[2] The term flare can mean different things to different people, and any definition needs to capture all of the potential patient experiences. Other example terms that people may use to describe flares include "flare-up", "exacerbation", or a "worsening of symptoms".[13] Practically, we advise focussing on and exploring individual patient definitions of flares.

A key feature of osteoarthritis flares is the notable sudden change from day-to-day "usual" symptoms. For some people, painful flares may feel more like fleeting and frequent fluctuations rather than prolonged periods of change.[14 15] The role of symptoms such as stiffness and swelling in flares remains unclear, as do their underlying mechanisms.[9] Pain and its consequences are the predominant symptom that has been examined in the literature and is often the primary reason for consultation in primary care. During flares, people describe their pain as "sharp", "stabbing", "throbbing", and "intense" experiences that can affect activities, disrupt sleep, and lead to emotional exhaustion.[14-16]

Figure 1, drawn by a person with knee osteoarthritis from a qualitative study, depicts mild increases of pain versus a more prominent and severe increase in pain that can impact on ability to perform daily activities, the latter more likely to be synonymous with flares.[15 17] The notable feature is how flares deviate from usual day-to-day pain patterns. The figure does not demonstrate other symptoms people may associate, such as stiffness, swelling, or difficulty with activities of daily living (eg, climbing stairs and lifting pans for cooking).

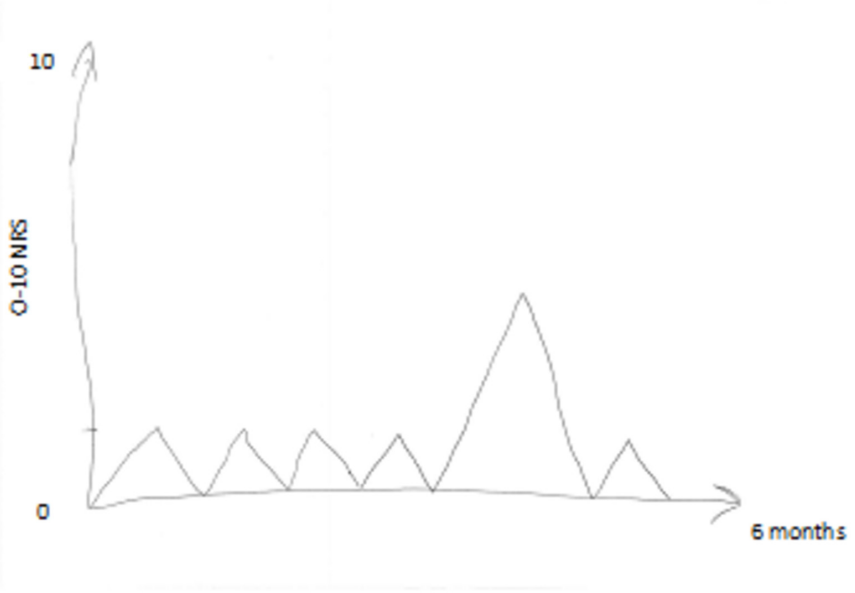

Fig 1 | Drawing by a person with osteoarthritis illustrating the variability of their knee pain, punctuated by a flare which is depicted by the sudden large episodic increase in pain on a 0-10 numeric rating scale (NRS)[17]

Clinical recognition

In practice, an osteoarthritis flare can usually be recognised as an acute change in symptoms characterised by worsening pain, morning stiffness ≥20 minutes, pain related sleep disturbance, limping, swelling or effusion, increased warmth, and symptoms that affect usual activities and lead to mood changes.[18 19] Tools to help detect and assess flare occurrence are under development, with the recent validation of a patient-reported instrument for use in research[19] and development of a physician-reported scoring tool.[18] In the latter, a French general practice database study, accuracy of patient self-report for a knee osteoarthritis flare compared with physician diagnosis was very high (96.5%), suggesting that in clinical practice, healthcare professionals can be guided by people recognising their own flares.[18] This is helpful for self-management, as in our experience, peoples' flares and their healthcare consultations do not often coincide, and episodes frequently subside by the time of appointment.

Duration

Observational studies examining flare duration are emerging. Recent evidence indicates that flares of knee osteoarthritis last approximately three to eight days.[8 9 20]

People at risk of flares

While flares can happen to anyone with osteoarthritis, limited evidence has attempted to identify which people might be at greater risk. In an Australian cohort of 313 adults with knee osteoarthritis, a risk prediction model was developed to predict flare occurrence over a 30 day observation period.[21] Factors related to demographic (older age, high body mass index), disease (longer duration, higher reported baseline pain and worse pain levels, higher intermittent and constant pain scores on standardised questionnaires, knee buckling), and lifestyle (previous knee injury and footwear with poor stability and greater heel height) predicted flare occurrence in a multivariable model.[21] Although these variables may be helpful to consider during consultation conversations, further validation of this model is required before it can be applied in the clinical setting.[21]

Differentiating from alternative diagnoses

It may be difficult for a person or healthcare professional to differentiate between a flare state and possible progression of osteoarthritis, as presentation of the two can be conflated. A diagnosis of osteoarthritis, and subsequent flares, is usually made on clinical grounds. Imaging is not recommended routinely, but may be necessary if symptoms are atypical.[2] Alternative diagnoses, such as gout flare, acute calcium pyrophosphate crystal arthritis, apatite-associated destructive arthritis, rheumatoid arthritis, septic arthritis, malignancy, trauma or avascular necrosis, may be ruled out by further investigation with biochemical tests and/or plain radiography.

What are triggers of flares?

People who experience flares want to know why they happen. Flares vary from person to person, and may also progress in frequency and impact within people over time.[16] Studying flares requires self-controlled methodologies to examine whether exposure to potential triggers is more frequent than usual just before a flare. Within-person case-crossover studies have observed a range of potential triggers (table 1). The strongest associations were observed for physical exposures, including knee buckling/giving way potentially caused by pain, knee instability, or lack of muscle strength.[9 24] In one study of knee pain, activity related triggers (increased time spent walking outside, standing for long periods, squatting or kneeling, and going up and down ladders) demonstrated a graded-exposure relationship with flare onset within 24 hours.[9] Other triggers for flares include psychosocial factors (eg, low mood) and poor sleep,[9 25 27] however these factors can also be a consequence of pain. Weather related observations have been more inconsistent.[30] Differences across studies in strength of associations are likely to be the result of differences in study design. We recommend that observed triggers from the literature be used as examples only, to help people to identify their own unique potential flare triggers.

Table 1 | Examples of potential flare triggers observed in knee and hip osteoarthritis case-crossover studies

Knee joint	Hip joint
Physical factors	
Increased walking outside without a rest[9] Prolonged standing without a rest[9]	Giving way[22]
Moderate physical activity[9 23]	
Squatting/kneeling[8 9]	
Lifting/moving heavy objects[8 9]	
Going up and down ladders[8 9]	
Injury, buckling[9 24]	
Psychosocial factors	
Worse mental health[25 26]	Worse mental health[26]
Low mood/depression or angry/irritable[9]	Poor sleep/fatigue[27]
Poor sleep[9]	Pain catastrophising and lower pain self-efficacy beliefs[28]
Environmental factors	
Cold/damp weather[9]	High daily variation in ambient temperature[29]

How can flares be managed?

Osteoarthritis management requires a biopsychosocial approach.[31] As highlighted by recent UK NICE guidelines,[2] limited evidence is available to guide intervention and management advice specifically for flares. A recent scoping review of behavioural, lifestyle, and adjunctive treatments for flares highlighted the lack of evidence to underpin clinical practice.[32] This review also confirmed a lack of evidence for outcomes beyond pain, limited understanding of symptom trajectories, and predominant research focus on the knee joints.[32]

Holistic flare management is different from managing the underlying condition. For example, principal recommendations that support management of osteoarthritis as a chronic long-term condition include education/information provision, person-centred therapeutic exercise, and weight management.[2] Each person's unique individual perception and awareness of flares should be recognised in clinical consultations. In our experience, flares are rarely discussed during consultations for osteoarthritis, particularly in the period following diagnosis. A goal of consultation should be to make people aware of flares as a common part of the condition, and promote positive messages for self-management.[33]

Pattern detection

As well as having wide ranging potential triggers, flares can be unpredictable, which can be one of the most challenging aspects of self-management.[9 15 16] Improving predictability may be possible if the person can more deliberately reflect on their own potential triggers. Invite people to keep a diary of their symptoms to help with understanding their personal flare behaviours. This suggestion is consistent with the broader recommendations of international guidelines to consider self-management approaches for managing symptoms.[2-4 34] Even if some triggers do not always result in flares, or cannot be easily modified, confidence in self-management may be improved by better anticipating their potential onset. Once people become more aware of their own typical flare patterns, and if symptoms persist beyond usual patterns with or without intervention, this might suggest a need to re-consult for further management advice to rule out differential diagnoses and explore further treatment options.[2] This pragmatic approach to patient-initiated follow-up fits with the UK NICE guidelines.[2] While the role of flares in long-term prognosis is unclear, in our opinion, consultations should focus on reducing flare frequency and impact.

Lifestyle/behavioural modification

In our experience, modifying activity or behaviour might help prevent or reduce flare frequency. However, whether usual exercise or physical activity should continue during a flare remains unclear; preliminary findings from a scoping review that included nine studies (six with sample sizes less than 100) on flare management in knee and hip osteoarthritis suggest reducing intensity while symptoms are severe.[32] In our experience, short term relative rest and gentle, low level movement may be necessary to help bring the flare under control, with a gradual build-up to usual exercise or physical activity levels as soon as possible. Estimating a person's recovery timescale is difficult. This will likely coincide with the resolution of the flare episode and usually may take a few days or more. Helping people to avoid catastrophising increases in pain may also improve regular participation in physical activity.[35]

Exercise-related flares are likely to become less common as people become more accustomed to graded exercise.[36]

Furthermore, people may benefit from the use of aids to assist with daily tasks during a flare of their osteoarthritis, for example using jar openers, electric can openers, gripping tools, vegetable peelers, and secateurs that all help ease pressure on hand joints.

Pharmacological management

One aim of initiating intervention at the time of a flare is to rapidly reduce the flare symptoms and impact, which is different to managing the chronic condition. Common pharmacological intervention options include joint specific topical non-steroidal anti-inflammatory drugs (NSAIDs), oral pain medication (eg, NSAIDs), and intra-articular corticosteroid injections for flares with more severe symptoms and greater impact on usual activities.[4 5] Prescribe the lowest effective dose for the shortest period possible, to mitigate variable efficacy, short-term effectiveness, and potential side effects (eg, gastrointestinal disorders, worsening asthma, renal impairment, and thrombotic events).[2 4 5 34] Paracetamol and weak opioids should only be considered in certain short-term circumstances, for example, when other treatments are contraindicated (eg, history of allergy, history of gastrointestinal bleeding owing to NSAIDs, history of stomach or duodenal ulcers, or severe renal impairment), not tolerated, or ineffective.[2]

Recently examined pharmacological therapies for flares that are not yet used widely in clinical practice include oral prednisolone, intramuscular glucocorticoids and hyaluronan injections.[37-39] These interventions require further research.

Escalation of treatment and referral

If symptoms do not respond to non-pharmacological and pharmacological therapies, consider progression of osteoarthritis as the likely diagnosis. Assess the patient's readiness and willingness for referral to secondary care,[40] and discuss onward options, in line with current guidelines.[2] Criteria for referral include:

- Pharmacological management and lifestyle/behaviour modifications (including therapeutic exercise) have been unsuccessful or are unsuitable, or
- Symptoms are not improving and are having a severe impact on quality of life.[2]

What people with osteoarthritis need to know

- Flares are personal experiences and can be common in osteoarthritis. Symptoms such as pain, stiffness, and swelling, are worse than normal, last at least 24 hours, and may affect mood and the ability to undertake usual activities, for example shopping or household tasks, and sleep.
- For many people, the sudden increase in symptoms usually lasts from a couple of days to just over a week.
- Evidence suggests that sometimes changes in physical activities, such as climbing a lot of stairs, or the way people feel, such as experiencing low mood, can trigger flares.
- Trying to identify if there might be any personal flare triggers may help people feel more in control of managing osteoarthritis.
- It may be appropriate to take extra pain medication for a short period.

Education into practice

- What signs and symptoms are suggestive of an osteoarthritis flare in clinical practice?
- How might you discuss potential flare triggers and their management?

How patients were involved in the creation of this article

A person with osteoarthritis who experiences flares (CW) co-authored this article. They contributed to the planning and writing of the article and ensured that evidence-informed answers to the questions in this article were included, and that discussion of patient-healthcare professional conversations were framed positively. CW supported any suggestions that have been made in the absence of clear evidence.

How this article was created

Preparation of this article draws on a review of the literature, a programme of flare research, and our clinical experiences of consultation for osteoarthritis from both the patient and healthcare professional perspectives.

Contributorship and the guarantor: EP conceived the article and is guarantor. All authors wrote and reviewed the article, created the boxes, and contributed to the preparation of figures. EP was the contact for patient involvement.

Competing interests: We have read and understood the *BMJ* policy on declaration of interests. The *BMJ* has judged that the authors have no disqualifying financial ties to commercial companies that are relevant to this paper. EP sat on the committee for the development of the UK NICE 2022 osteoarthritis guidelines. MJT is a member of the Outcome Measures in Rheumatology (OMERACT) Flares in Knee and Hip Osteoarthritis Working Group, a member of the Versus Arthritis Musculoskeletal Disorders Research Advisory Group, and a steering group member of the International Foot and Ankle Osteoarthritis Consortium. MJT has received registration expenses through a British Society for Rheumatology educational bursary to attend a one day course on Rheumatology Practice for Allied Health Professionals.

Funding: EP is funded by a National Institute for Health and Care Research (NIHR) Academic Clinical Lectureship (CL-2020-10-001). MJT received no funding for this manuscript but has previously received funding from Health Education England (HEE)/NIHR to study osteoarthritis flares and currently receives research funding from the NIHR and Versus Arthritis. The views expressed are those of the authors and not necessarily those of the NHS, the NIHR, HEE, or the Department of Health and Social Care, or any other organisations.

Provenance and peer review: commissioned; externally peer reviewed.

We would like to thank Philip Conaghan, NIHR Leeds Biomedical Research Centre, for his comments on the initial plan for this article.

1 Bijlsma JWJ, Berenbaum F, Lafeber FPJG. Osteoarthritis: an update with relevance for clinical practice. *Lancet* 2011;377:-26. doi: 10.1016/S0140-6736(11)60243-2 pmid: 21684382

2 National Institute for Health and Care Excellence. *Osteoarthritis in over 16s: diagnosis and management. Clinical guidance NG226*. NICE, 2022.

3 Kloppenburg M, Kroon FPB, Blanco FJ, etal. 2018 Update of the EULAR recommendations for the management of hand osteoarthritis. *Ann Rheum Dis* 2019;78:-24. doi: 10.1136/annrheumdis-2018-213826 pmid: 30154087

4 The Royal Australian College of General Practitioners. *Guideline for the management of knee and hip osteoarthritis*. 2nd ed. RACGP, 2018.

5 Sellam J, Courties A, Eymard F, etalFrench Society of Rheumatology. Recommendations of the French Society of Rheumatology on pharmacological treatment of knee osteoarthritis. *Joint Bone Spine* 2020;87:-55. doi: 10.1016/j.jbspin.2020.09.004 pmid: 32931933

6 GBD 2021 Osteoarthritis Collaborators. Global, regional, and national burden of osteoarthritis, 1990-2020 and projections to 2050: a systematic analysis for the Global Burden of Disease Study 2021. *Lancet Rheumatol* 2023;5:-22. doi: 10.1016/S2665-9913(23)00163-7 pmid: 37675071

7 Parry E, Ogollah R, Peat G. Significant pain variability in persons with, or at high risk of, knee osteoarthritis: preliminary investigation based on secondary analysis of cohort data. *BMC Musculoskelet Disord* 2017;18:. doi: 10.1186/s12891-017-1434-3 pmid: 28196504

8 Parry E, Ogollah R, Peat G. 'Acute flare-ups' in patients with, or at high risk of, knee osteoarthritis: a daily diary study with case-crossover analysis. *Osteoarthritis Cartilage* 2019;27:-8. doi: 10.1016/j.joca.2019.04.003 pmid: 30995523

9 Thomas MJ, Rathod-Mistry T, Parry EL, Pope C, Neogi T, Peat G. Triggers for acute flare in adults with, or at risk of, knee osteoarthritis: a web-based case-crossover study in community-dwelling adults. *Osteoarthritis Cartilage* 2021;29:-64. doi: 10.1016/j.joca.2021.04.007 pmid: 33933585

10 Guillemin F, Ricatte C, Barcenilla-Wong A, etal. Developing a preliminary definition and domains of flare in knee and hip osteoarthritis (OA): consensus building of the flare-in-OA OMERACT Group. *J Rheumatol* 2019;46:-91. doi: 10.3899/jrheum.181085 pmid: 31092709

11 Cross M, Dubouis L, Mangin M, etal. Defining flare in osteoarthritis of the hip and knee: a systematic literature review—OMERACT virtual special interest group. *J Rheumatol* 2017;44:-7. doi: 10.3899/jrheum.161107 pmid: 28668808

12 King LK, Epstein J, Cross M, etal. Endorsement of the domains of knee and hip osteoarthritis (OA) flare: A report from the OMERACT 2020 inaugural virtual consensus vote from the flares in OA working group. *Semin Arthritis Rheum* 2021;51:-22. doi: 10.1016/j.semarthrit.2021.03.010 pmid: 33775461

13 Parry EL, Thomas MJ, Peat G. Defining acute flares in knee osteoarthritis: a systematic review. *BMJ Open* 2018;8:e019804. doi: 10.1136/bmjopen-2017-019804 pmid: 30030311

14 Murphy SL, Lyden AK, Kratz AL, etal. Characterizing pain flares from the patient perspective of individuals with symptomatic knee osteoarthritis. *Arthritis Care Res (Hoboken)* 2015;67:-11. doi: 10.1002/acr.22545 pmid: 25580697

15 Parry E, Dikomitis L, Peat G, Chew-Graham C. How do people with knee osteoarthritis perceive and manage flares? A qualitative study. *BJGP Open* 2022;6:BJGPO.2021.0086.

16 Hawker GA, Stewart L, French MR, etal. Understanding the pain experience in hip and knee osteoarthritis—an OARSI/OMERACT initiative. *Osteoarthritis Cartilage* 2008;16:-22. doi: 10.1016/j.joca.2007.12.017 pmid: 18296075

17 Parry EL. Acute flares in knee osteoarthritis [dissertation]. UK: University of Keele; 2019.

18 Marty M, Hilliquin P, Rozenberg S, etal. Validation of the KOFUS (Knee Osteoarthritis Flare-Ups Score). *Joint Bone Spine* 2009;76:-72. doi: 10.1016/j.jbspin.2008.07.018 pmid: 19297230

19 Traore Y, Epstein J, Spitz E, etal. Development and validation of the Flare-OA questionnaire for measuring flare in knee and hip osteoarthritis. *Osteoarthritis Cartilage* 2022;30:-96. doi: 10.1016/j.joca.2021.12.011 pmid: 35066175

20 Thomas MJ, Yu D, Nicholls E, etal. Short-term recovery trajectories of acute flares in knee pain: a UK-Netherlands multicenter prospective cohort analysis. *Arthritis Care Res (Hoboken)* 2020;72:-92. doi: 10.1002/acr.24088 pmid: 31600034

21 Atukorala I, Pathmeswaran A, Makovey J, etal. Can pain flares in knee osteoarthritis be predicted? *Scand J Rheumatol* 2021;50:-205. doi: 10.1080/03009742.2020.1829035 pmid: 33467963

22 Fu K, Makovey J, Metcalf B, etal. Role of hip injury and giving way in pain exacerbation in hip osteoarthritis: an internet-based case-crossover study. *Arthritis Care Res (Hoboken)* 2019;71:-7. doi: 10.1002/acr.23708 pmid: 30044548

23 Atukorala I, Pathmeswaran A, Batuwita N, etal. Is being barefoot, wearing shoes and physical activity associated with knee osteoarthritis pain flares? Data from a usually barefoot Sri Lankan cohort. *Int J Rheum Dis* 2021;24:-105. doi: 10.1111/1756-185X.14024 pmid: 33200581

24 Zobel I, Erfani T, Bennell KL, etal. Relationship of buckling and knee injury to pain exacerbations in knee osteoarthritis: a web-based case-crossover study. *Interact J Med Res* 2016;5:e17. doi: 10.2196/ijmr.5452 pmid: 27342008

25 Efrani T, Keefe F, Bennell K, et al. Psychological factors and pain exacerbation in knee osteoarthritis: a web-based case-crossover study. *Rheumatol (Sunnyvale)* 2015;S6:005.

26 Wise BL, Niu J, Zhang Y, etal. Psychological factors and their relation to osteoarthritis pain. *Osteoarthritis Cartilage* 2010;18:-7. doi: 10.1016/j.joca.2009.11.016 pmid: 20346403

27 Fu K, Makovey J, Metcalf B, etal. Sleep quality and fatigue are associated with pain exacerbations of hip osteoarthritis: an internet-based case-crossover study. *J Rheumatol* 2019;46:-30. doi: 10.3899/jrheum.181406 pmid: 30936279

28 Fu K, Metcalf B, Bennell KL, etal. The association between psychological factors and pain exacerbations in hip osteoarthritis. *Rheumatology (Oxford)* 2021;60:-9. doi: 10.1093/rheumatology/keaa494 pmid: 32940708

29 Fu K, Metcalf B, Bennell KL, etal. Association of weather factors with the risk of pain exacerbations in people with hip osteoarthritis. *Scand J Rheumatol* 2021;50:-73. doi: 10.1080/03009742.2020.1760929 pmid: 32614268

30 Ferreira ML, Zhang Y, Metcalf B, etal. The influence of weather on the risk of pain exacerbation in patients with knee osteoarthritis - a case-crossover study. *Osteoarthritis Cartilage* 2016;24:-7. doi: 10.1016/j.joca.2016.07.016 pmid: 27492467

31 Neogi T. The epidemiology and impact of pain in osteoarthritis. *Osteoarthritis Cartilage* 2013;21:-53. doi: 10.1016/j.joca.2013.03.018 pmid: 23973124

32 Bowden JL, Kobayashi S, Hunter DJ, etal. Best-practice clinical management of flares in people with osteoarthritis: A scoping review of behavioral, lifestyle and adjunctive treatments. *Semin Arthritis Rheum* 2021;51:-60. doi: 10.1016/j.semarthrit.2021.04.017 pmid: 34144385

33 Caneiro JP, O'Sullivan PB, Roos EM, etal. Three steps to changing the narrative about knee osteoarthritis care: a call to action. *Br J Sports Med* 2020;54:-8. doi: 10.1136/bjsports-2019-101328 pmid: 31484634

34 Kolasinski SL, Neogi T, Hochberg MC, etal. 2019 American College of Rheumatology/Arthritis Foundation Guideline for the Management of Osteoarthritis of the Hand, Hip, and Knee. *Arthritis Care Res (Hoboken)* 2020;72:-62. doi: 10.1002/acr.24131 pmid: 31908149

35 Lazaridou A, Martel MO, Cornelius M, etal. The association between daily physical activity and pain among patients with knee osteoarthritis: The moderating role of pain catastrophizing. *Pain Med* 2019;20:-24. doi: 10.1093/pm/pny129 pmid: 30016486

36 Sandal LF, Roos EM, Bøgesvang SJ, etal. Pain trajectory and exercise-induced pain flares during 8 weeks of neuromuscular exercise in individuals with knee and hip pain. *Osteoarthritis Cartilage* 2016;24:-92.

37 Kroon FPB, Kortekaas MC, Boonen A, etal. Results of a 6-week treatment with 10 mg prednisolone in patients with hand osteoarthritis (HOPE): a double-blind, randomised, placebo-controlled trial. *Lancet* 2019;394:-2001. doi: 10.1016/S0140-6736(19)32489-4 pmid: 31727410

38 Wang Q, Mol MF, Bos PK, etal. Effect of intramuscular vs intra-articular glucocorticoid injection on pain among adults with knee osteoarthritis: The KIS randomized clinical trial. *JAMA Netw Open* 2022;5:e224852. doi: 10.1001/jamanetworkopen.2022.4852 pmid: 35380645

39 Huang Y, Lascarides P, Nagai W, etal. Three weekly intra-articular injections of Hylan G-F 20 vs arthrocentesis in patients with chronic idiopathic knee osteoarthritis: a multicentre, evaluator- and patient-blinded, randomized controlled trial. *Curr Ther Res Clin Exp* 2023;99:100707.

40 Hawker GA, Bohm E, Dunbar MJ, etalBEST-Knee Study Team. Patient appropriateness for total knee arthroplasty and predicted probability of a good outcome. *RMD Open* 2023;9:e002808. doi: 10.1136/rmdopen-2022-002808 pmid: 37068914