

Recommendations for weight management in osteoarthritis: a systematic review of clinical practice guidelines

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Abstract

Background: While targeting obesity is central to osteoarthritis management, recent meta-analyses demonstrate that significant weight loss has only modest effects on symptoms, and no effect on structure. In countries such as USA, adults gain on average 0.5 to 1 kilogram per year from early to middle adulthood. Preventing weight gain is easier to achieve and sustain than weight loss and reduces knee pain. The World Health Organisation has recommended that effective management of obesity should include prevention of weight gain, weight maintenance as well as weight loss; however, it is unclear whether such recommendations appear in guidelines for osteoarthritis. Therefore, we systematically reviewed the recommendations and approaches for weight management in all current clinical practice guidelines (CPGs) for osteoarthritis.

Methods: Nine databases were searched (1st January 2010 to 15th March 2022) to identify guidelines informing the non-pharmacological management of osteoarthritis. Three reviewers appraised guidelines according to the AGREE II instrument, and independently extracted data on their characteristics. One author extracted and summarised guideline recommendations on weight management. This systematic review is registered on PROSPERO (CRD42021274195).

Results: Fifteen CPGs from developed and developing countries were included. Weight loss was recommended for knee (12 of 13 guidelines) and hip (10 of 11 guidelines) but not hand (0 of 4 guidelines) osteoarthritis. Combination approaches of diet and/or exercise were recommended for overweight or obese individuals in knee (8 of 12) and hip (4 of 10) osteoarthritis, with 2 guidelines specifying $\geq 5\%$ weight loss. One of 15 guidelines specified strategies for weight loss and maintenance of lost weight. Two of 15 guidelines recommended controlling body weight for osteoarthritis, regardless of obesity status. There was discordance between strength of recommendation for weight loss and level of evidence in 3 of 15 guidelines. The included guidelines had a median AGREE II domain score of 78.7% (interquartile range 71.4, 87.9).

Conclusion: Most CPGs for knee and hip osteoarthritis recommend weight loss to manage obesity in osteoarthritis despite evidence for modest benefit. Given weight gain is common in adults, other approaches such as preventing weight gain should be considered to improve outcomes in osteoarthritis.

Introduction

Osteoarthritis is a progressive whole joint disorder that causes significant pain and disability¹, resulting in substantial healthcare burden. There are no approved disease-modifying drugs for osteoarthritis, so a major focus is on tackling modifiable risk factors to improve symptoms and slow disease progression. Obesity is one of the most significant modifiable risk factors for osteoarthritis symptoms and disease progression, especially for the knee involvement^{1,2}. As such, targeting obesity is one of the central messages in the management of osteoarthritis²⁻⁴.

Clinical trials have reported that weight loss of 10% of total body weight has only limited effects on pain^{5,6}, physical function^{5,7} and disease progression^{8,9} in knee osteoarthritis. These findings are concordant with recent meta-analyses examining the effect of weight loss on pain, function and structural outcome in knee and hip osteoarthritis¹⁰⁻¹³. Weight loss of 5–10% of total body weight had only a modest effect on pain improvement in knee osteoarthritis [standardised mean difference 0.33 (95% confidence interval (CI) 0.17, 0.48]¹⁰, comparable to that of paracetamol (effect size 0.21, 95% CI 0.02, 0.41)¹⁴. A meta-analysis showed that osteoarthritis pain, function and stiffness scores only improved by 2 percentage for every 1% weight loss¹⁵. As established by the OMERACT-OARSI, a 20% improvement from baseline is required to achieve a clinically important improvement in pain and function¹⁶, which means a 10% weight loss is necessary; and for a patient with osteoarthritis to experience a 50% reduction in pain, as much as 25% weight loss is necessary¹⁵. Consistently, in a recent randomised clinical trial that utilised video-based telehealth exercise and ketogenic very-low-calorie diet intervention, which successfully achieved an average of 10% body weight loss over 12 months, compared with controls, it only showed a mean reduction of pain by 1.3 points on a 10-point numeric rating scale (mean - 1.3, 95% CI -2.0, -0.7, $p < 0.01$)¹⁷. However, even substantial weight loss (up to 20% of total body weight) does not have a clinically significant effect on joint structure¹².

While addressing obesity in osteoarthritis, it is important to consider the trajectory of weight gain that results in an increasing proportion of the population shifting from healthy weight to overweight and obesity¹⁸⁻²⁰. The weight trajectory which is similar across different communities¹⁸⁻²¹ tends to show that weight gain is typically accelerated during early adulthood¹⁹ and at certain transitional stages in life (e.g. pregnancy²²), as well as progressive weight increase at a rate of 0.5-1kg per year from early to middle adulthood^{19,21}. Weight gain of, as little as 5kg, is associated with increased risk of many chronic diseases, including osteoarthritis¹⁹. Once an individual has become obese, many weight loss strategies to address obesity are often impractical and of limited medium to long term efficacy with weight reaccumulating^{23,24}. Additionally, even with successful weight loss, the risk of some chronic diseases such as diabetes does not return to the same level as compared to those who did not gain weight²⁵. There is also evidence that preventing small weight gain reduced knee pain in the community²⁶.

The World Health Organisation (WHO) has recommended that effective management of obesity should encompass a whole range of strategies ranging from prevention of weight gain, weight maintenance and the management of obesity related comorbidities, in addition to promotion of weight loss²⁷; however, it is unclear whether such recommendations appear in clinical practice guidelines for osteoarthritis. Therefore, we systematically reviewed the recommendations and approaches for weight management in all current osteoarthritis clinical practice guidelines.

Methods

This systematic review was reported according to the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines²⁸. This review is prospectively registered on PROSPERO (CRD42021274195).

Search strategy

Nine databases (Ovid MEDLINE, Ovid Embase, Cochrane Library, CINAHL Plus, PsycINFO, Scopus, PEDro, ScienceDirect and Google Scholar) were searched from 1st January 2010 to 15th March 2022 using MeSH terms, Boolean operators and key words to identify guidelines for the non-pharmacological management of osteoarthritis. The following search strategies were used: (i) MEDLINE [OA AND (Guideline* OR Evidence* OR Best* OR Recommend* OR Protocol*) AND (Weight OR BMI OR Overweight OR Obes* OR Body weight OR Body composition OR Weight reduction programs)] and (ii) other databases [(Osteoarthritis* Guideline* OR Osteoarthritis* Protocol OR Osteoarthritis* Evidence OR Osteoarthritis* Recommend* OR Osteoarthritis* Best*) AND (Weight* OR Body Mass Index (BMI) OR BMI OR Overweight OR Obes* OR Waist circumference)]. Searches were limited to English language. Websites of individual international renowned arthritis societies and organisations (Appendix 1) and the Guidelines International Network (GIN) International Guidelines Library were browsed to further identify potentially relevant guidelines.

Guideline selection

JW and SMH independently assessed the eligibility of available guidelines using a 3-stage determination method: title then abstract screening, followed by full text screening, with disagreement between the two authors resolved by adjudication from a senior author, FMC.

The inclusion criteria were all latest versions (up to 15th March 2022) of international or national clinical practice guidelines on non-pharmacological management of osteoarthritis, especially related to recommendation on weight management in osteoarthritis, without limitation on the site of osteoarthritis. Guidelines were excluded if: (1) guidelines only targeted on a single component of non-pharmacological management and/or pharmacological management and/or surgical management of osteoarthritis; (2) guidelines involved patients with joint replacements; (3) recommendations were derived without a systematic literature search or critical appraisal of studies.

Data extraction

Two authors (JW and SMH) independently extracted data from each of the included guidelines. Extracted data were cross-checked for consistency by YZL. The following data were extracted and tabulated: guideline characteristics (guideline organisation affiliation, year of publication), target group, guideline development group, evidence base, grading system, site of osteoarthritis, recommendation and approaches for weight management (target group, weight loss strategies, magnitude of weight loss) and its priority in relation to other recommendations in the guidelines.

Guideline appraisal

JW and MME independently appraised each included guideline using the appraisal of guidelines for research and evaluation (AGREE) II instrument²⁹ after completion of the appropriate training³⁰. Any significant discrepancies in the scores (where assigned scores differed by more than two points) were resolved and independently reassessed by a third author (SMH). AGREE II includes 23 items across 6 domains: scope and purpose, stakeholder involvement, rigour of development, clarity and presentation, applicability, and editorial independence (each rated from 1 [strongly disagree] to 7 [strongly agree]) and users rate the overall quality of each guideline (1 to 7) and recommend for or against its use. Scaled domain scores (0–100%) are based on the sum of ratings across all appraisers and the difference between the maximum and minimum possible scores²⁹. The domain score is calculated by summing all the scores of the individual items in a domain for each of the appraisal, and subsequently scaling and standardising as a percentage of the maximum possible score for that domain. Although the AGREE II instrument does not provide a cut-off to distinguish between high- and low-quality guidelines, we considered guidelines with domain and overall scores of < 50% to be low quality^{31–33}.

Synthesis of guideline recommendations

Each guideline was initially analysed to gain an overall understanding of the content and followed by textual descriptive synthesis to analyse the scope, context and consistency of guideline recommendations on weight management in osteoarthritis. JW independently coded the guidelines to identify and extract weight recommendations in each guideline, which were cross-checked by YZL. Recommendations from guidelines were tabulated and summarised to provide an overview of all recommendations. In this systematic review, key recommendation refers to either “core recommendation”, “key priorities”, “good clinical practice” or when the recommendation is positioned as the top three recommendations within the osteoarthritis clinical practice guideline.

Results

Search results

A total of 8612 records were identified through electronic database searching, with 6452 records remained (2160 duplicates) for title and abstract screening (Fig. 1). Forty-seven records proceeded to full text screening (35 records were excluded with reasons) while an additional 42 records were identified through other sources (websites of individual internationally renowned arthritis societies and organisations, GIN library and citation search), of which 39 were excluded with reasons (Fig. 1). In total, 15 guidelines were included in this systematic review.

Guideline characteristics

Table 1 shows the characteristics and development processes of all the included guidelines. Guideline development groups were affiliated with either a professional organisation or a government department: American College of Rheumatology (ACR)³; European League Against Rheumatism (EULAR)^{34,35}; Italian Society for Rheumatology (ISR)³⁶; Turkish League Against Rheumatism (TLAR)³⁷; Pan American League of Associations for Rheumatology (PANLAR)³⁸; Rheumatology and Immunology Specialised Committee³⁹; Malaysian Society of Rheumatology (MSR)⁴⁰; Osteoarthritis Research Society International (OARSI)⁴; European Society for Clinical and Economic Aspects of Osteoporosis, Osteoarthritis and Musculoskeletal Diseases (ESCEO)⁴¹; American Academy of Orthopaedic Surgeons (AAOS)^{42,43}; the Royal Australasian College of General Practitioners (RACGP)⁴⁴; Department of Veterans Affairs and Department of Defence (VaDoD)⁴⁵ and National Institute for Health and Care Excellence (NICE)⁴⁶. Development of all guidelines involved a multidisciplinary team, most (n = 9) comprised of a working group of medical experts, literature review team, allied health and patient representatives^{3,4, 34-36,38,41,45,46}. There were no patient representatives in the RACGP, AAOS, TLAR, MSR and the Chinese guidelines^{37,39,40,42-44}. The target groups included mostly clinicians, health professionals and allied health managing patients with osteoarthritis^{3,4,34-46} while 4 guidelines also targeted other stakeholders (e.g. patients, policy makers and health insurance agencies)^{34-36,40}.

Table 1
Characteristics of the included guidelines (n = 15)

Author / Year / Country	Organisational affiliation	Funding body	Target group	Guideline development group	Guideline review / journal publication	Guideline update	Evidence base methods	LoE	SoR
AAOS 2021 US ⁴³	American Academy of Orthopaedic Surgeons (AAOS)	AAOS	Orthopaedic surgeons, other healthcare providers, medical practitioners	Multidisciplinary	Internal and external N	5 years	SLR GRADE	Y	Y
VADoD 2020 US ⁴⁵	Department of Veterans Affairs (VA) and Department of Defence (DoD)	VADoD	Primary care providers or specialists	Multidisciplinary	Internal and external N	NR	SLR GRADE	N	Y
Zhang 2020 China ³⁹	Rheumatology and Immunology Specialized Committee, Cross-Straits Medicine Exchange Association	Rheumatology and Immunology Expert Committee of the Cross-Strait medical and Health Exchange Association	Chinese clinicians, specialists, professionals involved in management of OA	Multidisciplinary	Internal and external Y	2022	SLR GRADE RIGHT checklist	Y	Y
Kolasinski 2019 US ³	American College of Rheumatology (ACR)	ACR and the Arthritis Foundation	Patients and clinicians	Multidisciplinary	External Y	NR	SLR GRADE	Y	Y
Bannuru 2019 US ⁴	Osteoarthritis research society international (OARSI)	OARSI	Clinicians	Multidisciplinary	External Y	NR	SLR GRADE	Y	Y
Bruyere 2019 Belgium ⁴¹	European Society for Clinical and Economic Aspects of Osteoporosis, Osteoarthritis and Musculoskeletal Diseases (ESCEO)	ESCEO	Clinicians	Multidisciplinary	Internal and external Y	NR	SLR GRADE	N	Y
Ariani 2019 Italy ³⁶	Italian Society for Rheumatology (ISR)	ISR	Physicians, health professionals, patients and policy makers	Multidisciplinary	External Y	Stated (no planned date)	SLR AGREEII	Y	N
RACGP 2018 Australia ⁴⁴	Royal Australasian College of General Practitioners (RACGP)	Funded in part by Medibank Better Health Foundation	General practitioners, health professionals	Multidisciplinary	External (approved by Chief Executive Officer of NHMRC) N	5 years	SLR GRADE	Y	Y
Kloppenborg 2018 The Netherlands ³⁵	European League Against Rheumatism (EULAR)	EULAR	All health professionals, patients and relevant stakeholders (e.g. policy makers, health insurance companies)	Multidisciplinary	Internal Y	NR	SLR AGREEII	Y	Y

* Presented as Level of agreement

Author / Year / Country	Organisational affiliation	Funding body	Target group	Guideline development group	Guideline review / journal publication	Guideline update	Evidence base methods	LoE	SoR
AAOS 2017 US ⁴²	American Academy of Orthopaedic Surgeons (AAOS)	AAOS	Clinicians, surgeons, specialists, allied health	Multidisciplinary	Internal and External N	5 years	SLR GRADE	Y	Y
Tuncer 2017 Turkey ³⁷	Turkish League Against Rheumatism (TLAR)	NR	Clinicians	Multidisciplinary	Internal Y	NR	SLR Oxman-Guyatt index and Jadad Scale	Y	Y
Rillo 2016 Venezuela ³⁸	Pan American League of Associations for Rheumatology (PANLAR)	PANLAR	NR	Multidisciplinary	Internal and External Y	NR	SLR Jadad scale	Y	Y
NICE 2014 UK ⁴⁶	National Institute for Health and Care Excellence (NICE)	NICE	Clinicians, patients	Multidisciplinary	External N	Stated (No planned date)	SLR GRADE	Y	N
Fernandes 2013 Norway ³⁴	European League Against Rheumatism (EULAR)	EULAR	Clinicians, healthcare providers, researchers in OA, policy makers	Multidisciplinary	Internal Y	NR	SLR EULAR Standard operating procedure	Y	Y*
MOH 2013 Malaysia ⁴⁰	Malaysian Society of Rheumatology (MSR)	Ministry of Health Malaysia (MOH) and MSR	Healthcare professionals, relevant stakeholders in all healthcare setting	Multidisciplinary	External N	2017	SLR Scottish Intercollegiate Guidelines Network	Y	Y
* Presented as Level of agreement									

In all the included guidelines, the evidence to support recommendations was derived from a systematic literature review (SLR)^{3,4,34-46}, with detailed methodology outlined, except for the PANLAR guideline (Appendix eTable1). The method used to grade the quality/certainty of the evidence differed among guidelines: majority (8 of 15) of the guidelines used Grading of Recommendations Assessment, Development and Evaluation (GRADE)^{3,4,39,41,43-46}; others are detailed in Table 1 and Appendix eTable 1. Thirteen guidelines described the strength of their recommendations^{3,4,35-45} using different criteria, as described in Appendix eTable1. The 2 guidelines (EULAR and NICE) that did not provide strength of recommendations (SoR) had graded the level of evidence^{34,46}. In 8 of 13 guidelines, the SoR was concordant with the quality of evidence from the SLR^{3,4,39,41-45}. The EULAR guidelines (knee/hip²⁵ and hand³⁵) provided level of agreement among all task force members^{34,35} with additional grading of their recommendations³⁵. Economic considerations were taken into account in the NICE guideline⁴⁶.

All guidelines were peer-reviewed, either internally from experts within the affiliated organisation group (n = 9)^{34,35,37-39,41-43,45} and/or externally by experts within the relevant field (n = 12)^{3,4,36,38-46}. Nine guidelines were also subjected to a peer-review process required for journal publication^{3,4,34-39,41}.

The site of osteoarthritis in the included guidelines varies (Tables 2 to 4): knee osteoarthritis (n = 13)^{3,4,34,36-41,43-46}, followed by hip osteoarthritis (n = 11)^{3,4,34,36,38-40,42,44-46} and hand osteoarthritis (n = 4)^{3,35,36,38}. The OARSi provided guideline for polyarticular osteoarthritis⁴. The NICE and osteoarthritis guideline in China did not specify the type of osteoarthritis, but encompassed knee, hip and hand osteoarthritis^{39,46}.

Table 4
Summary of weight loss recommendation in osteoarthritis (other than knee and hip or unspecified) guidelines

	Zhang 2020 ³⁹	ACR 2019 ³	OARSI 2019 ⁴	ISR 2019 ³⁶	EULAR 2018 ³⁵	PANLAR 2016 ³⁸	NICE 2014 ⁴⁶
Site of osteoarthritis	All types of OA	Hand	Polyarticular	Hand	Hand	Hand	All types of OA
Is weight loss recommended?	Y	N	Y	N	N	N	Y
LoE	Level A		Polyarticular: Level 1B				NR
SoR	Strong		Polyarticular OA: Conditional				NR
Target group			no comorbid conditions				overweight or obese who have associated functional limitations
Recommendation on magnitude of weight loss	NR		NR				NR
Weight loss strategies / other comments	Evidence for weight loss were mainly derived from knee osteoarthritis.	Weight management only recommended for knee and/or hip osteoarthritis	Dietary ± exercise in certain subgroup (no comorbid conditions; widespread pain and/or depression).	Weight loss recommended for patients with hip and knee osteoarthritis who are overweight.			NR
Abbreviation:							
LoE: level of evidence							
N: no							
NR: not reported							
OA: osteoarthritis							
SoR: strength of recommendation							
Y: yes							

Methodological quality

The mean scores for the AGREE-II domains were 35.5 to 92.5 (Table 5). Six guidelines (AAOS knee⁴³, ACR³, OARSI⁴, RACGP⁴⁴, EULAR hand³⁵, EULAR knee/hip³⁴) had mean domain scores of > 80%. Overall guideline assessment scores ranged from 3.00 to 6.50 out of 7 maximum possible score [median(%) 6.0, (interquartile range 4.6, 6.0)]. Of the guidelines (ISR³⁶ and MSR⁴⁰) that scored low (< 50% mean domain scores), shortcomings included limited or no descriptions of input from guideline end users or patients; criteria for selecting evidence, strengths and limitations of evidence, and methods for formulating recommendations; external reviews before publication; plans for updating; barriers to implementation, resource implications, and how to implement guideline recommendations; and measures taken to ensure editorial independence.

Table 5
Guideline assessment according to the AGREE-II instrument

Author/ Guideline organisation or society / year	Domain scores (%)							Mean overall quality (maximum possible score = 7)
	Scope and purpose	Stakeholder involvement	Rigour of development	Clarity and presentation	Applicability	Editorial independence	Mean domain scores (%)	
AAOS 2021 ⁴³ (knee)	100.0	88.1	96.4	100.0	82.1	82.1	91.5	6.0
VADoD 2020 ⁴⁵	95.2	61.9	93.8	95.2	73.2	53.6	78.8	6.0
Zhang 2020 ³⁹	90.5	81.0	87.5	88.1	30.4	82.1	76.6	6.0
ACR 2019 ³	97.6	92.9	94.6	100.0	37.5	75.0	82.9	6.0
OARSI 2019 ⁴	96.1	74.3	100.0	95.3	68.9	81.7	86.1	6.0
ESCEO 2019 ⁴¹	90.5	69.0	76.8	100.0	50.0	85.7	78.7	6.0
ISR 2019 ³⁶	30.7	78.0	54.8	89.0	33.0	12.8	49.7	3.5
RACGP 2018 ⁴⁴	100.0	98.0	84.0	79.9	87.2	82.3	88.6	6.2
EULAR 2018 ³⁵ (hand)	90.0	88.9	100.0	97.6	85.3	93.2	92.5	5.6
AAOS 2017 ⁴² (hip)	56.0	78.5	65.2	84.0	78.9	99.0	77.1	4.6
TLAR 2017 ³⁷	58.0	78.2	88.3	28.3	36.2	32.2	53.5	3.0
PANLAR 2016 ³⁸	81.0	69.0	58.9	92.6	41.1	85.7	71.4	5.0
NICE 2014 ⁴⁶	86.1	44.2	99.0	100.0	70.6	50.1	75.0	5.8
EULAR 2013 ³⁴ (knee/hip)	94.4	90.6	89.4	53.1	100.0	98.0	87.9	6.5
MSR 2013 ⁴⁰	20.0	18.8	12.0	67.1	30.2	65.0	35.5	4.0
Median score (%; IQR)	90.5 (58.0,96.1)	78.2 (69.0,88.9)	88.3 (65.2,96.4)	92.6 (79.9,100.0)	68.9 (36.2,82.1)	82.1 (53.6,85.7)	78.7 (71.4,87.9)	6.0 (4.6,6.0)
Abbreviation:								
AGREE II: Appraisal of Guidelines Research and Evaluation II								
IQR: interquartile range								

Weight management recommendations

Thirteen guidelines incorporated obesity management as part of weight management recommendations^{3,4,34,36-41,43-46}. There were no weight management recommendations in the EULAR hand osteoarthritis³⁵ and AAOS hip osteoarthritis guidelines⁴². Where weight management was included, it was one of the key recommendations in 9^{3,4,34,37,40,41,44-46} of the 12^{3,4,34,36,37,39-41,43-46} guidelines for knee osteoarthritis and 8^{3,4,34,38,40,44-46} of the 10^{3,4,34,36,38-40,44-46} guidelines for hip osteoarthritis.

Most knee osteoarthritis guidelines (12 of 13)^{3,4,34,36,37,39-41,43-46} had recommendations for management of obesity (Table 2). All guidelines recommended "weight loss" while 4 guidelines^{4,37,39,44} used the term "weight management" instead of "weight loss". Of these 4 guidelines, 2 guidelines recommended controlling body weight for all patients^{37,39}, regardless of obesity status. Nine of 12 knee osteoarthritis guidelines had moderate to strong recommendations for weight loss^{3,4,34,37,39-41,43,44}, but the level of evidence behind these recommendations varied (Appendix eTable1). Notably, in 3 of 12 knee osteoarthritis guidelines, the SoR for weight loss was discordant to the level of evidence: ACR³ had strong recommendation on moderate level of evidence; ESCEO⁴¹ had strong recommendation while level of evidence not reported; RACGP⁴⁴ had strong recommendation on very low level of evidence. Although the level of evidence behind the weight loss recommendation was drawn from randomised clinical trials, there were several issues that resulted in the quality of evidence being rated moderate (ACR³) and very low (RACGP⁴⁴): serious risk of bias from single-blind or unblinded study design; high attrition rates; wide confidence interval and short study period^{3,47}. The strength of recommendation was justified by the general view that weight loss has low risk of harms, such that the overall benefits outweigh the risks^{3,47}.

Of the 10 hip osteoarthritis guidelines had weight loss recommendation for weight management^{3,4,34,36,38-40,44-46} (Table 3), 7 guidelines^{3,34,36,38,40,45,46} recommended weight loss for hip osteoarthritis while 3 guidelines^{4,39,44} used the term "weight management". While the strength for weight loss

recommendation was strong in 4 of 9 guidelines (ACR³, RACGP⁴⁴, EULAR³⁴ and PANLAR³⁸), the level of evidence behind these recommendations varied (Appendix eTable 1). Discordance were seen in ACR³ (strong recommendation on moderate level of evidence) and RACGP⁴⁴ (strong recommendation on very low level of evidence).

None of the hand osteoarthritis guidelines recommended weight management^{3,35,36,38} (Table 4). For polyarticular osteoarthritis guideline, weight management was conditionally recommended⁴.

Target group for weight loss

Eleven of 12 recommendations for weight loss in knee osteoarthritis specifically targeted people who were overweight or obese^{3,34,36,37,39-41,43-46} (Table 2). Table 3 shows 10 of 11 guidelines that recommended weight loss for hip osteoarthritis targeted people who are overweight or obese, with the OARSI⁴ guideline specifically targeted those with BMI of ≥ 30 kg/m². While the NICE⁴⁶ guideline recommended weight loss for those who are overweight or obese with associated functional limitations, the OARSI⁴ guideline specifically targeted weight loss to those with no comorbid conditions, with gastrointestinal or cardiovascular conditions and with widespread pain and/or depression⁴ (Table 4).

Weight loss strategies suggested by guidelines

Nine of 12 knee osteoarthritis guidelines provided a general weight loss strategy^{3,4,34,36,37,43-46} (Table 2), with 8 of the 9 guidelines supported a general combination approach of exercise and/or dietary weight loss^{3,4,34,36,37,43-45}. NICE⁴⁶ provided reference to its own obesity guideline (NICE guideline for obesity⁴⁸ on evidence of the most effective weight loss strategies) for strategies to lose weight. The EULAR³⁴ guideline further described examples of strategies that were recognised to effect successful weight loss and maintenance, such as increase physical activity, follow a structured meal plan, limit portion size, nutritional education etc.

For hip osteoarthritis, 7 of 10 guidelines described a general, non-specific weight loss strategy that comprised of a combination of dietary and/or concomitant exercise^{3,4,34,36,44-46} (Table 3). Conversely, OARSI⁴ guideline recommended against dietary weight loss for individuals with hip osteoarthritis of any comorbidity but acknowledged that it may be recommended as part of a healthy lifestyle regimen to those with BMI ≥ 30 kg/m²⁴.

The OARSI⁴ guideline for polyarticular osteoarthritis recommended weight loss using a combination of dietary weight management with or without an exercise component for those without comorbid conditions but recommended against dietary weight management for individuals with frailty⁴. The NICE⁴⁶ guideline specifically referred to the NICE obesity guideline⁴⁸ to provide recommendation for individuals who are overweight or obese with associated functional limitations.

Except for the EULAR³⁴ guideline, all other guidelines have not provided details on strategies to effective dietary or concomitant exercise interventions for weight loss, specifically no details regarding type, duration, frequency or intensity of the recommended approach. There were no guidelines that mentioned the role of pharmacological or surgical weight loss interventions for osteoarthritis except for EULAR knee/hip³⁴ guideline (Tables 2 and 3) that acknowledged the role of bariatric surgery as part of comprehensive weight management in people with knee or hip osteoarthritis who are morbidly obese.

Magnitude of weight loss

Two^{3,44} of 12 knee and 2^{3,44} of 10 hip osteoarthritis guidelines specified the magnitude of weight loss required for weight management: ACR guideline recommended $\geq 5\%$ of body weight³; RACGP guideline recommended a minimum weight loss target of 5-7.5% for those with BMI ≥ 25 kg/m²⁴⁴. The ACR guideline acknowledged a dose-response relationship in the degree of weight loss, such that clinically important benefits continue to increase with weight loss of 5-10%, 10-20% and $> 20\%$ of body weight³.

Discussion

We systematically reviewed the recommendations and approaches for weight management in 15 current osteoarthritis clinical practice guidelines. Most clinical practice guidelines recommended weight loss for knee (12 of 13 guidelines)^{3,4,34,36,37,39-41,43-46} and hip osteoarthritis (10 of 11 guidelines)^{3,4,34,36,38-40,44-46} but not hand osteoarthritis (0 of 4 guidelines)^{3,35,36,38}. In guidelines recommending weight loss, it was often highlighted as one of the key recommendations for management of osteoarthritis, targeting individuals with overweight and obesity. However, the details varied with respect to recommendation for the degree of weight loss required and strategies suggested to achieve target weight loss, such that most guidelines do not provide much advice as to how to lose weight effectively or maintain weight once weight loss is achieved. Two guidelines recommended $\geq 5\%$ loss of body weight for management of knee and hip osteoarthritis^{3,44}. While the main strategies recommended included combination approaches such as diet and exercise or a concomitant exercise program, the advice was general and non-specific. Only 1 guideline included strategies for weight maintenance of the lost weight³⁴, and 2 guidelines^{39,44} recommended controlling body weight as part of management of osteoarthritis, regardless of obesity status. Importantly, there is a discordance between SoR and the level of evidence in some guidelines, with strong recommendation for weight loss being justified by overall lack of harms in weight loss, such that the benefits of weight loss outweigh the risks, despite limitation in the available evidence in osteoarthritis.

Overall, osteoarthritis clinical practice guidelines of the knee and hip place significant emphasis on weight loss as a management strategy to address obesity in osteoarthritis, despite the discordance between quality of evidence, SoR and evidence of modest effect of weight loss in knee and hip osteoarthritis symptoms and joint structure⁵⁻¹³. The underlying reason for such emphasis may relate to a paradigm of addressing obesity as an underlying risk factor to slow disease progression, in the absence of disease-modifying therapies. However, osteoarthritis extends as continuum of disease from a healthy joint to one with early osteoarthritis and then disease progression to end-stage disease^{2,49}, with obesity related structural changes detected even prior to the development of clinical symptoms in early adulthood^{50,51}. Hence, by the time a person has symptomatic, radiographic osteoarthritis, it is not surprising that weight loss has a modest effect due to the established disease and limited reversibility⁴⁹. Successful weight loss is difficult to achieve for most patients even when recommended for other chronic diseases such as diabetes and cardiovascular disease^{52,53}. Even if targeted weight loss is successfully achieved, maintenance of weight loss is challenging, often met with relapse^{24,54}, owing to a variety of reasons such as dysregulation of appetite hormones⁵⁴. With such barriers, there is the potential for setting unrealistic goals for patients which also need to be considered in a context where the likelihood of benefit is overstated.

Whilst some guidelines acknowledged the inconsistency of evidence underpinning the recommendation for weight loss in osteoarthritis^{4,43,45}, it is considered that weight loss is likely to have overall health benefits, with the notion of no anticipated harms, hence justifying their strength of recommendation. There was limited acknowledgement in the assessed guidelines of the potential harms related to promoting weight loss, which may relate to the underlying social attitudes to obesity and could be further compounded by the generic advice for weight loss in osteoarthritis clinical guidelines. We highlighted that most recommendations for weight loss were general and lack of details with little specificity relating to the inclusion of composition, type, duration, intensity and frequency of either dietary or exercise programs recommended, potentially translating to ambiguity in care around weight loss recommendations for healthcare providers. In studies of the perspectives of people with osteoarthritis regarding weight loss, participants reported awareness about potential health benefits of weight loss, dissatisfaction with their weight, and emotions of anxiety and disempowerment about achieving weight loss⁵⁵⁻⁵⁷. Repeated failures to achieve idealistic weight loss outcome have the potential to demoralise and perpetuate negative thoughts and self-blame that further deter weight loss success^{58,59}. More than 50% of people with overweight and obesity experienced internalised weight stigma⁶⁰, such that they were 'blamed' for not getting better, and can be associated with negative consequences, including maladaptive coping mechanisms such as unhealthy eating behaviours and exercise avoidance, that eventually leads to increased obesity and weight gain over time⁶¹.

In line with the WHO recommendation, prevention of weight gain is as important as promotion of weight loss in tackling the obesity crisis²⁷. Yet, thus far, weight loss has been the focus in addressing obesity in osteoarthritis, with minimal attention to preventing weight gain. Preventing weight gain should receive more emphasis in the management of osteoarthritis, with efforts to prevent individuals of normal weight from becoming overweight, overweight individuals from becoming obese and weight regain in those who have since lost weight²⁷. In a recent Australian study, it was estimated that total knee replacement (TKR) in males and females could be prevented by 36.55% and 34.92% respectively if the population was not at risk of being overweight or obese⁶². Moreover, the proportion of TKRs attributed to overweight and obesity could be reduced by 20% if its overweight and obese population were to move down one BMI category⁶². A recent meta-analysis demonstrated that low intensity weight related behaviour interventions including diet and physical activity which resulted in small energy deficits were effective at prevention of weight gain⁶³, where interventions were most effective in non-obese populations⁶³. For example, the estimated small cumulative energy imbalance of around 30kj per day is comparable to ½ medium sized apple a week or a serve of dark chocolate a fortnight⁶⁴. Minor lifestyle changes targeting this small cumulative positive energy imbalances may be considered more pragmatic, achievable and sustainable in the daily life through adulthood to prevent the insidious development of obesity over time^{65,66}. We highlighted in this systematic review that only two of fifteen guidelines^{37,39} recommended prevention of weight gain in osteoarthritis. As such, weight gain prevention interventions should be considered when an individual presents with joint pain, which has been shown to be effective irrespective of weight, gender or BMI⁶³ and relevant to all individuals of a healthy weight or above.

This systematic review has several strengths. A methodologically comprehensive and rigorous search was conducted systematically in nine databases with additional browsing of citations and international arthritis organisations to limit the potential for missing guidelines. Pairs of independent reviewers screened, critically appraised, and extracted data from the guidelines, reflecting the high methodological rigour in this review. The limitation of this review is that it includes only guidelines published in English which limits the external validity of this review to users from English-speaking jurisdictions, particularly when osteoarthritis and obesity are a global issue.

In conclusion, most clinical practice guidelines for management of knee and hip osteoarthritis consistently recommend weight loss, generally targeted to people who are overweight or obese, despite evidence of modest at best effect of weight loss on symptoms¹⁰⁻¹³ and no effect on joint structure¹². Given obesity is a major risk factors for osteoarthritis, the prevention of weight gain may be more effective and practical in improving clinical outcomes for osteoarthritis, and hence should be considered as part of the key management in osteoarthritis.

Abbreviations

AGREE II
Appraisal of Guidelines Research and Evaluation II
GRADE

Grading of Recommendations Assessment, Development and Evaluation

LoE

Level of evidence

N

No

NHMRC

National Health and Medical Research Council

NR

not reported

OA

osteoarthritis

RIGHT

Reporting Items for Practice Guidelines in Healthcare

SLR

systematic literature review

SoR

strength of recommendation

Y

Yes

Table 2

Summary of weight loss recommendation in knee osteoarthritis guidelines (n = 13)

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Authors' contributions:

YZL: analysis and interpretation of the data; drafting of the article; final approval of the article

JW: acquisition of data; analysis and interpretation of the data; final approval of the article

SMH: conception and design; acquisition of data; analysis and interpretation of data; critical revision of the article for important intellectual content; final approval of the article

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Tables

Tables 2 and 3 are available in the Supplementary Files section.

Figures

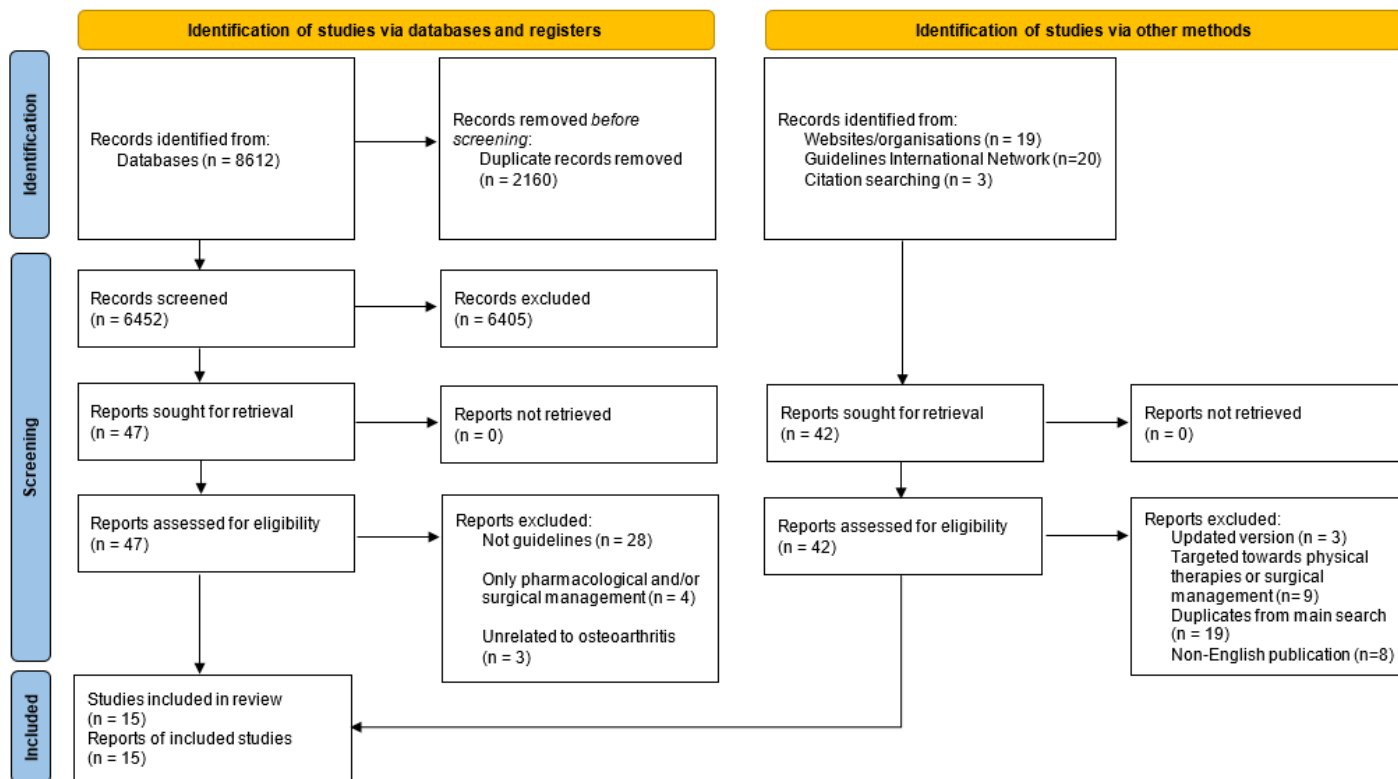


Figure 1

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram of search algorithm

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Table2and3.docx](#)
- [Appendix1.docx](#)
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