Supplementary materials

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S1. MOOSE checklist

ltem No	Recommendation	Reported on Page Number	Reported on Section/Paragraph
Repo	rting of background		
1	Problem definition	Page 4	Introduction
2	Hypothesis statement	Page 4	Introduction
3	Description of Study Outcome(s)	Page 5	Outcome, Methods
4	Type of exposure or intervention used	Page 5	Eligibility Criteria, Methods
5	Type of study design used	Page 5	Eligibility Criteria, Methods
6	Study population	Page 5	Eligibility Criteria, Methods
Repo	rting on search strategy		
7	Qualifications of searchers (e.g., librarians and investigators)	Using existing search strategies	
8	Search strategy, including time period included in the synthesis and keywords		Supplementary S2
9	Effort to include all available studies, including contact with authors	Page 5-6	Searches, Methods
10	Databases and registries searched	Page 5	Searches, Methods
11	Search software used, name and version, including special features used (e.g., explosion)	Page 6	Study selection and data collection, Methods
12	Use of hand searching (e.g., reference lists of obtained articles)	Page 5	Searches, Methods
13	List of citations located and those excluded, including justification		Figure 1 (PRISMA flowchart)
14	Method for addressing articles published in languages other than English	Page 5	Searches, Methods
15	Method of handling abstracts and unpublished studies	Page 5	Searches, Methods
16	Description of any contact with authors	Page 5-6	Searches, Methods
Repo	rting of methods		
17	Description of relevance or appropriateness of studies assembled for assessing the hypothesis to be tested		Table 1
18	Rationale for the selection and coding of data (e.g., sound clinical principles or convenience)	Page 6	Study selection and data collection, Methods
19	Documentation of how data were classified and coded (e.g., multiple raters, blinding,	Page 6	Study selection and data

	and interrater reliability)		collection, Methods
20	Assessment of confounding (e.g., comparability of cases and controls in studies where appropriate)		Tables 1, S3 and S11
21	Assessment of study quality, including blinding of quality assessors; stratification or regression on possible predictors of study results	Page 6	Risk of bias assessment/ Methods
22	Assessment of heterogeneity	Page 7	Exploration of heterogeneity, Methods
23	Description of statistical methods (e.g., complete description of fixed or random effects models, justification of whether the chosen models account for predictors of study results, dose-response models, or cumulative meta-analysis) in sufficient detail to be replicated	Page 6-7	Data synthesis approach, Methods
24	Provision of appropriate tables and graphics		Results
Repo	rting of results		
25	Graphic summarizing individual study estimates and overall estimate		Figures 3, 4, and S5
26	Table giving descriptive information for each study included		Tables S3 and S11
27	Results of sensitivity testing (e.g., subgroup analysis)		Tables S7, S8, and S10
28	Indication of statistical uncertainty of findings		Table 2 and S6
Repo	rting of discussion		
29	Quantitative assessment of bias (e.g., publication bias)		Figures S9
30	Justification for exclusion (e.g., exclusion of non–English-language citations)		Not applicable
31	Assessment of quality of included studies		Figures 2 and 4
Repo	rting of conclusions		
32	Consideration of alternative explanations for observed results		Conclusion
33	Generalization of the conclusions (i.e., appropriate for the data presented and within		Conclusion
24	the domain of the literature review)		Canalysian
54	Guidelines for future research		Conclusion
35	Disclosure of funding source		Sources of funding

From: Brooke BS, Schwartz TA, Pawlik TM. MOOSE Reporting Guidelines for Meta-analyses of Observational Studies. JAMA Surg. 2021;156(8):787–788. doi:10.1001/jamasurg.2021.0522

S2. Search Strategy as applied in MEDLINE and Embase

S2.1 Total knee replacement

Medline

- 1. survey.mp. or exp Data Collection/
- 2. prospective study.mp. or exp Prospective Studies/
- 3. observational study.mp.
- 4. exp EPIDEMIOLOGY/ or epidemiology.mp.
- 5. longitudinal study.mp. or exp Longitudinal Studies/
- 6. follow up study.mp. or exp Follow-Up Studies/
- 7. exp Arthroplasty, Replacement, Knee/ or exp Knee Prosthesis/ or knee replacement.mp.
- 8. knee prosthesis.mp. or exp Knee Prosthesis/
- 9. total knee.tw.
- 10. (knee adj10 (replace\$ or arthroplast\$ or prosthe\$ or implant\$)).ti, ab.
- 11. 7 or 8 or 9 or 10
- 12. pain.tw.
- 13. 1 or 2 or 3 or 4 or 5 or 6
- 14. 10 and 12 and 13

Embase

- 1. Clinical study/
- 2. Longitudinal study/
- 3. Prospective study/
- 4. Cohort analysis/
- 5. (Cohort adj (study or studies)).mp.
- 6. (follow up adj (study or studies)).tw.
- 7. (observational adj (study or studies)).tw.
- 8. (epidemiologic\$ adj (study or studies)).tw.
- 9. exp Arthroplasty, Replacement, Knee/ or exp Knee Prosthesis/ or knee replacement.mp.
- 10. knee prosthesis.mp. or exp Knee Prosthesis/
- 11. total knee.tw.
- 12. (knee adj10 (replace\$ or arthroplast\$ or prosthe\$ or implant\$)).ti,ab.
- 13. pain.tw.
- 14. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8
- 15. 9 or 10 or 11 or 12
- 16. 13 and 14 and 15

S2.2 Total hip replacement

Medline

- 1. survey.mp. or exp Data Collection/
- 2. prospective study.mp. or exp Prospective Studies/
- 3. observational study.mp.
- 4. exp EPIDEMIOLOGY or epidemiology.mp.
- 5. longitudinal study.mp. or exp Longitudinal Studies/
- 6. follow up study.mp. or exp Follow-Up Studies/
- 7. exp Arthroplasty, Replacement, Hip/ or exp Hip Prosthesis/ or hip replacement.mp.
- 8. hip prosthesis.mp. or exp hip Prosthesis/
- 9. total hip.tw.
- 10. (hip adj10 (replace\$ or arthroplast\$ or prosthe\$ or implant\$)).ti, ab.

11. 7 or 8 or 9 or 10
 12. pain.tw.
 13. 1 or 2 or 3 or 4 or 5 or 6
 14. 10 and 12 and 13

Embase

- 1. Clinical study/
- 2. Longitudinal study/
- 3. Prospective study/
- 4. Cohort analysis/
- 5. (Cohort adj (study or studies)).mp.
- 6. (follow up adj (study or studies)).tw.
- 7. (observational adj (study or studies)).tw.
- 8. (epidemiologic\$ adj (study or studies)).tw.
- 9. exp Arthroplasty, Replacement, hip/ or exp hip Prosthesis/ or hip replacement.mp.
- 10. hip prosthesis.mp. or exp hip Prosthesis/
- 11. total hip.tw.
- 12. (hip adj10 (replace\$ or arthroplast\$ or prosthe\$ or implant\$)).ti,ab.
- 13. pain.tw.
- 14. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8
- 15. 9 or 10 or 11 or 12
- 16. 13 and 14 and 15

S3. Characteristics of TKR studies

Study	Operation	Pain measure	Definition of
Country	Number of patients		unfavourable pain
Recruitment dates	Age (SD), range		outcome
Setting	% women		High risk of bias concern
Alzahrani 2011[1]	Primary TKR, all 18+	WOMAC pain	No clinically important
TWH cohort	N=482	12 months	improvement based on
Canada	67.5 (9.6)		MCID (WOMAC index of
1998-2007	62%		7.5)
2 hospitals			
Aso 2020[2]	Primary TKR, all	VAS/NRS pain	Moderate to severe pain
Japan	N=234	6, 12 months	(VAS >30 mm), at rest or
2012-2017	75		waiking
1 hospital	75.8%		
Attal 2014[3]	Primary TKR, all 18+	BPI (NRS)	NRS pain average 3 or
France	N=89	3, 6, 12 months	greater on 10-point scale
2008-2011	68.7 (8.9)		
l hospital	65.0%		
Baker 2007[4]	Primary TKR, all	OKS pain	Reported persistent knee
UK	N=9417	12 months	pain
2003	70.68		
National registry	56.8%		
Bell 2023[5]	Primary TKR, all 50-89	KOOS pain	MCID not satisfied (15
USA	N=5564	12 months	points)
2015-2018	Range 50-89		
7 hospitals	60.7%		
Birch 2019[6]	Primary TKR or UKR, all	OKS pain	OKS pain moderate/severe
Denmark	N=589	4, 12 months	
2011-2013	67.3 (9.7)		High loss to follow up rate
1 hospital	52.0%		at 4 and 12 months
Due a de a 0000171			<u>)/40_40</u>
Brander 2003[7]	Primary IKR, all 18+	VAS/NRS pain	VAS >40
USA 1000.0000		3, 6, 12 months	
1998-2000	66 (10.5), range 36-85		
I surgeon	55.2%		Thus shall 40 00[00]
Buus 2022[8]	Primary IKR, all 18+	OKS pain	I nresnola 42.39[69]
	$ \mathbf{N}=\mathbf{Z} /$		
2013-2010 1 hospital	00.0 (9.3) 52.2%		
Ruvanandran 2010[0]	Drimony TKP all		NPS pain with movement
	Finitary INA, all N=206	e monthe	≥4
2011 2017	11=230 65	omontins	
2011-2017 1 hospital	65.2%		
rnospital	00.07/0		

Chodor and Kruczynski 2022[10]	Primary TKR, all 48+	Author own	Pain severely limiting daily
Poland	N=09	6 months	
2016	67.6 (7.42), range 46-64	omontilo	
1 hospital	70.7%		
Clement 2014[11]	Primary TKB all	Author's own	Fair or poor
	N=578	question "How	High loss to follow up rate
2010	70 (9.6) range 39-91	well did the	
1 hospital	58 4%	surgery relieve	
rhoophai	00.170	affected joint?"	
		12 months	
Cole 2022[12]	Primary TKR, all	OKS pain	<14 points OKS
UK	N=1025	12 months	
2010-2015	70		
2 hospitals	55.8%		
Dave 2017[13]	Primary TKR probably,	WOMAC pain	WOMAC pain score <
USA	all 40+	12 months	MCID (WOMAC pain of 15)
2012-2014	N=267		
3 hospitals	66 (9)		
	61.0%		
Dowsey 2012[14]	Primary TKR, all	IKSS pain	IKSS pain score <30
Australia	N=478	12, 24 months	moderate to severe pain
2006-2007	70.8 (8.3), range 45-90		
1 hospital	69.2%		IKSS may not be entirely
			24 months
Dursteler 2021[15]	Primary TKR, all 18+	VAS/NRS pain	NRS 0.3/1 or greater at rest
Spain	N=170	3, 6 months	
2014-2017	73.1 (7.1)		
Spain	73.3%		
1 hospital			
Edwards 2022[16]	Primary TKR, all 45+	BPI	4/10 or greater
USA	N=248	6 months	
2012-2018	65.1 (8.2)		High loss to follow up rate
2 hospitals	59.5%		
Escobar and Riddle	Primary TKR, all	WOMAC pain	Number not attaining PASS
2014[17]	N=1616	12 months	(i.e. "No" in the question, " <i>If</i>
Spain	71.6 (6.8)		you had to be the rest of your life with the symptoms
2003-2006	70.0%		you have now, how would
15 hospitals			you feel?") as the twenty-
			fifth percentile of the final
			the seventy-fifth percentile
			(reverse option for WOMAC
			scores).
			Libela la casta f. U
Cataobaw 0001[10]		DDI	High loss to follow up rate
Getacnew 2021[18]	Primary IKK, all 18+	вы	BPI worst pain score ≥4

Norway	N=206	12 months	
2012-2014	68 (9)		
1 hospital	66.0%		
Ghomrawi 2017[19]	Primary TKR, all	WOMAC pain	Number not achieving
USA	N=247	24 months	MCID (baseline-adjusted
2010-2012	68 (10)		MCIDs, as described by Escobar et al [70])
1 hospital	65.0%		
Grosu 2016[20]	Primary TKR probably,	VAS/NRS pain	Moderate to severe pain
Belgium	all	3, 6, 12 months	
2009-2010	N=114		High loss to follow up rate
1 surgeon	66 (10)		at 3, 6 and 12 months
	65.8%		
Hardy 2022[21]	Primary TKR, all >18	VAS/NRS pain	VAS >30/100
France	N=111	12 months	
2014-2015	73.3 (9.3) range 29-92		
1 hospital	65.0%		
Heath 2021[22]	Primary and revision	EQ-5D 5L pain/	Moderate/ severe or
Australia	IKR, all	discomfort	extreme pain EQ 5D 5L
2018-2020	N=8299	6 months	pani/discomort
44 hospitals	67.5 (8.8)		High loss to follow up rate
	56.4%		
Jones 2000[23]	Primary IKR, all 40+	WOMAC pain	Moderate/ severe pain defined as a gain of <10
	N=292	6 months	points on the WOMAC pain
1995-1997	69.2 (9.2)		dimension
I health region	59.0%		
Knalid 2021[24]	Primary IKK of UKK, all	OKS pain	less at six months after
UN 2008 2016	N=531,790	6 months	knee replacement can be
2000-2010	69.7 (9.4)		considered to be in chronic
	50.0 %		pain
Kim 2015[25]	Primary IKR, all women	VAS/NRS pain	>5 points on an 11 point
South Korea	N=94	3 months	rating scale)
2013-2014	70.18 (5.74), range 20- 80		ö ,
1 nospital	100%		
Kiran 2015[26]	Primary TKB all	OKS nain	Has your knee replacement
I IK	N=608	12 24 months	operation decreased your
2003-2007	72	12, 21 montho	knee pain?
1 hospital	61 4%		
rhospital	01.470		High loss to follow up rate
			at 12 and 24 months
Kornilov 2018[27]	Primary TKR, all 18+	VAS/NRS pain	Not at least a two-point or
Russia	N=100	12 months	(clinically significant)
2014	63 (8), range 47-81		decrease in rating of pain
1 hospital	95.0%		interference with walking
			trom baseline to 1 year
Kurion 2018[28]	Primary TKP probably		
	all	6 months	- or yrealer
Before 2017	N=50	0 11011113	

1 hospital	66.4 (8.3)		
	60.0%		
Larsen 2021[29]	Primary TKR, all 18+	VAS/NRS pain	Pain intensity at rest >3
Denmark	N=185	12 months	
2015-2016	68.8 (8.9)		High loss to follow up rate
1 hospital	55.7%		
Latijnhouwers	Primary TKR, all	VAS/NRS pain	Moderate to severe pain
2022[30]	N=282	12 months	(NRS ≥4)
The Netherlands	66 (8.4)		
2012-2017	63.0%		High loss to follow up rate
2 hospitals			
Lavand'homme	Primary TKR or UKR, all	VAS/NRS pain	NRS ≥4/10
2014[31] Bolgium	N=128	3 months	
2012	68 (10)		
2012 1 surgeon	66.4%		
	Primary TKR probably	Pain disturbing	Night pain was defined as
South Korea	all	sleep	pain around the knee
2017-2010	N=172	3. 12 months	experienced at night that
2017-2019 2 surgeons	70.7 (4.3)	-,	could disturb the patient's
2 Surgeons	89.2%		sleep
Leppanen 2021[33]	Primary TKR, 65 years	VAS pain	VAS >30
Finland	or younger	exercise	
2012-2014	N=205	24 months	
1 hospital	60		
	63.0%		
Leung 2019[34]	Primary TKR, all	Author own	No change or worsening
Singapore	N=243	6 12 months	pany signity better
2015	66 (8.3)	0, 12 11011115	
1 hospital	/8.6%		
Lundblad 2008[35]	Primary IKR, all	VAS/NRS pain	Pain at rest, VAS >2/10
Sweden	N=69	24 months	
Before 2006	68		
	50.7%		
Lyman 2018[36]	Primary IKR, all	KOOS pain	MCID (8 by distribution-
USA 0007 0010	N=3815	24 months	based method [71])
2007-2012	74 (6)		/
i nospital	63.0%		High loss to follow up rate
Mahdi 2020[37]	Primary TKR, all	KOOS pain	8 cut off
Sweden	N=615	12 months	
2016-2018	69.7		High loss to follow up rate
3 hospitals	52.2%		
Mekkawy 2023[38]	Primary TKR, all	VAS pain	Probably NRS score of ≥1
USA	N=112	6 months	In defined sites
2021	65.5 (9.2)		
4 surgeons	69.0%		Concern over VAS ≥1 being too inclusive and high loss to follow up rate

Mercurio 2020[39]	Primary TKR, all >18	VAS/NRS pain	VAS >30 residual pain
Italy	N=45	12 months	
2015-2017	69.6 (7.8)		
1 hospital	65.0%		
Mezey 2023[40]	Primary TKR probably,	WOMAC pain	Not exceeding MCID
Hungary	all	12 months	(WOMAC pain of 13.3)
2019-2020	N=101		
2 hospitals	69.2		High loss to follow up rate
·	Not reported		
Musbahi 2023[41]	Primary TKR, all 40+	WOMAC pain	WOMAC pain score
USA	N=575	12 months	(converted to a 0-to-100
2011-2014	66.3 (8.3)		scale) improvement of <20
4 hospitals	60%		
			High loss to follow up rate
Nishimoto 2023[42]	Primary TKR, all with no	KOOS pain	Not achieving MCID of 10
Japan		3, 6 months	months). MCID was
2021-2023			calculated using the anchor
1 hospital	/5.1 (7.3)		method.[72]
	Primary TKR, all 30+		with range of motion VAS
USA Defene 0010	N=215	6 months	≥1
Before 2012	61.7 (9.8)		
2 hospitals	58.0%		Concern over VAS ≥1
			being too inclusive
Orr 2022[44]	Primary TKR, all	KOOS pain	Not achieved PASS (i.e.
USA	N=7476	12 months	"Taking into account all the
2016-2019	67 (9.0)		activity vou have during
9 hospitals	60.8%		your daily life, your level of
			pain and also your activity
			limitations and participation
			the current state of your
			knee satisfactory?") for
			KOOS pain
			High loss to follow up rate
Petersen 2015[45]	Primary TKR, all	VAS/NRS pain	VAS >3
Denmark	N=78	12 months	
Before 2014	69		High loss to follow up rate
1 hospital probably	59.0%		
Petersen 2018[46]	Primary TKR probably,	VAS/NRS pain	<30% reduction in pain
Denmark	all	12 months	
Before 2017	N= 200		
1 hospital	69 (1.2)		
	57.0%		
Phillips 2014[47]	Primary TKR, all	VAS/NRS pain	VAS >3
UK	N= 96	3, 6, 12 months	
2009-2010	70.6		
1 hospital	56.0%		

Priol 2023[48]	Primary TKR, all	VAS/NRS pain	VAS 4+
France	N=129	6 months	
2011-2012	74 (10), range 45-94		High loss to follow up rate
1 hospital	72.3%		
Pua 2019[49]	Primary TKR, all 50+	OKS pain	Moderate or severe pain
Singapore	N=5325	6 months	
2013-2017	68 (7.5)		
1 hospital	75.0%		
Quintana 2006[50]	Primary TKR, all	WOMAC pain	No improvement in pain
Spain	N=792	6 months	greater than MCID (22.60
1999-2000	71.9		of 100) using an anchor-
7 hospitals	73.0%		based method.
Rice 2018[51]	Primary TKR, all 18+	VAS/NRS pain	VAS >3
New Zealand	N=300	6, 12 months	
2012-2015	69 (10), range 48-90		
3 hospitals	48.0%		
Sideris 2022[52]	Primary TKR, all	VAS/NRS pain	NRS 4+
USA	N=179	6 months	
2016-2018	67.1 (8.1)		
1 hospital	56.2%		
Singh 2014[53]	Primary TKR, all	Author own	Moderate-severe pain
USA	N=7229	question	
1993-2005	68 (10)	24 months	
1 hospital	56.0%		
Solberg 2023[54]	Primary TKR probably,	Author own	To what extent have you
USA	all	question	obtained relief: somewhat,
2020	N=239	3 months	minimal of not at all
22 surgeons	66.2 (8.5), range 37-87		High loss to follow up rate
	60.7%		
Stephens 2002[55]	Primary TKR, all 50+	WOMAC pain	No change or increase in
USA	N=68	6 months	pain from pre-operative
Before 2001	67.4 (8.1), range 50-88		
1 hospital	54.0%		
Tang 2023[56]	Primary TKR probably,	VAS/NRS pain	NRS scores ≥4
China		3 months	
2020-2021	IN=190		
1 hospital	72 75 10/		
2024[57]	18+	VAS/NRS pain	VAS 3+
Spain	N=115	3, 6 11011115	
2018-2020	70.5 (10.7)		
1 home rehabilitation	66.1%		
service			
Thomazeau 2016[58]	Primary TKR, all	VAS/NRS pain	NRS score ≥1/10 for the
France	N=109	6 months	last 8 days
2013	69.2 (9)		
1 hospital	71.6%		

	Primary TKR or UKR, all	Author own	Moderate or severe pain on
China	<90 N 071	question 24 months	movement
2018-2019	N=271	24 11011015	
1 hospital			
	80.8%	1/00	
Otrillas-Compaired	Primary TKR, all	KSS pain	60 points)
Snain	N=215	12 months	
2009	/3 (6.35)		KSS may not be entirely
1 hospital	69.3%		patient reported
van der Wees	Primary IKR, all	VAS/NRS pain	30% or less improvement in
2017[01] The Netherlands	N=704	6, 12 months	VAS pain
	65 (12)		Lligh loop to follow up roto
1993-2014	64.5%		at 6 and 12 months
Vina 2020[62]	Primary TKR, all		Less than MCID of 1.5
	N=315	24 months	
2005-2015	67.3 (8.6)		
4 hospitals	60.9%		
Vuorenmaa 2008[63]	Primary TKR, all <80	VAS/NRS pain	VAS >30/100
Finland	N=51	3 months	
Before 2007	70 (5)		
2 surgeons	80%		
W-Dahl 2014[64]	Primary TKR, all	KOOS pain	Unchanged or worse pain
Sweden	N=2736	12 months	
2008-2010	69.3 (8.7)		
2 hospitals	58.5%		
Waimann 2014[65]	Primary TKR, all	WOMAC pain	Less than MCID of ≥20 in
	NL 000	O	
USA	N=236	6 months	both the WOMAC pain and
05A 2004-2007	N=236 65.1 (8.9)	6 months	both the WOMAC pain and function scores (scaled to 100)
2004-2007 2 hospitals	N=236 65.1 (8.9) 66.0%	6 months	both the WOMAC pain and function scores (scaled to 100)
2004-2007 2 hospitals Wylde 2013[66]	65.1 (8.9) 66.0% Primary TKR, all	WOMAC pain	both the WOMAC pain and function scores (scaled to 100) WOMAC pain score of >75
2004-2007 2 hospitals Wylde 2013[66] UK	N=236 65.1 (8.9) 66.0% Primary TKR, all N=57	WOMAC pain 12 months	both the WOMAC pain and function scores (scaled to 100) WOMAC pain score of >75
USA 2004-2007 2 hospitals Wylde 2013[66] UK 2010-2011	N=236 65.1 (8.9) 66.0% Primary TKR, all N=57 68	WOMAC pain 12 months	both the WOMAC pain and function scores (scaled to 100) WOMAC pain score of >75
USA 2004-2007 2 hospitals Wylde 2013[66] UK 2010-2011 1 hospital	N=236 65.1 (8.9) 66.0% Primary TKR, all N=57 68 58%	WOMAC pain 12 months	both the WOMAC pain and function scores (scaled to 100) WOMAC pain score of >75
USA 2004-2007 2 hospitals Wylde 2013[66] UK 2010-2011 1 hospital Wylde 2019[67]	N=236 65.1 (8.9) 66.0% Primary TKR, all N=57 68 58% Primary TKR, all eligible	WOMAC pain 12 months WOMAC pain	both the WOMAC pain and function scores (scaled to 100) WOMAC pain score of >75 Worse or no change in
USA 2004-2007 2 hospitals Wylde 2013[66] UK 2010-2011 1 hospital Wylde 2019[67] UK	N=236 65.1 (8.9) 66.0% Primary TKR, all N=57 68 58% Primary TKR, all eligible for Triathlon prosthesis	WOMAC pain 12 months WOMAC pain 3, 12, 24 months	both the WOMAC pain and function scores (scaled to 100) WOMAC pain score of >75 Worse or no change in WOMAC pain of 14 point
USA 2004-2007 2 hospitals Wylde 2013[66] UK 2010-2011 1 hospital Wylde 2019[67] UK 2006-2009	N=236 65.1 (8.9) 66.0% Primary TKR, all N=57 68 58% Primary TKR, all eligible for Triathlon prosthesis N=266	WOMAC pain 12 months WOMAC pain 3, 12, 24 months	both the WOMAC pain and function scores (scaled to 100) WOMAC pain score of >75 Worse or no change in WOMAC pain of 14 point (based on MCID)
USA 2004-2007 2 hospitals Wylde 2013[66] UK 2010-2011 1 hospital Wylde 2019[67] UK 2006-2009 1 hospital	N=236 65.1 (8.9) 66.0% Primary TKR, all N=57 68 58% Primary TKR, all eligible for Triathlon prosthesis N=266 70 (9.9), range 41-90	WOMAC pain 12 months WOMAC pain 3, 12, 24 months	both the WOMAC pain and function scores (scaled to 100) WOMAC pain score of >75 Worse or no change in WOMAC pain of 14 point (based on MCID)
USA 2004-2007 2 hospitals Wylde 2013[66] UK 2010-2011 1 hospital Wylde 2019[67] UK 2006-2009 1 hospital	N=236 65.1 (8.9) 66.0% Primary TKR, all N=57 68 58% Primary TKR, all eligible for Triathlon prosthesis N=266 70 (9.9), range 41-90 64%	WOMAC pain 12 months WOMAC pain 3, 12, 24 months	both the WOMAC pain and function scores (scaled to 100) WOMAC pain score of >75 Worse or no change in WOMAC pain of 14 point (based on MCID) High loss to follow up rate
USA 2004-2007 2 hospitals Wylde 2013[66] UK 2010-2011 1 hospital Wylde 2019[67] UK 2006-2009 1 hospital Yan 2023[68]	N=236 65.1 (8.9) 66.0% Primary TKR, all N=57 68 58% Primary TKR, all eligible for Triathlon prosthesis N=266 70 (9.9), range 41-90 64% Primary TKR, all 45+	WOMAC pain 12 months WOMAC pain 3, 12, 24 months VAS/NRS pain	both the WOMAC pain and function scores (scaled to 100) WOMAC pain score of >75 Worse or no change in WOMAC pain of 14 point (based on MCID) High loss to follow up rate NRS score of ≥1 at rest
USA 2004-2007 2 hospitals Wylde 2013[66] UK 2010-2011 1 hospital Wylde 2019[67] UK 2006-2009 1 hospital Yan 2023[68] China	N=236 65.1 (8.9) 66.0% Primary TKR, all N=57 68 58% Primary TKR, all eligible for Triathlon prosthesis N=266 70 (9.9), range 41-90 64% Primary TKR, all 45+ N=470	WOMAC pain 12 months WOMAC pain 3, 12, 24 months VAS/NRS pain 6 months	both the WOMAC pain and function scores (scaled to 100) WOMAC pain score of >75 Worse or no change in WOMAC pain of 14 point (based on MCID) High loss to follow up rate NRS score of ≥1 at rest and/or on movement
USA 2004-2007 2 hospitals Wylde 2013[66] UK 2010-2011 1 hospital Wylde 2019[67] UK 2006-2009 1 hospital Yan 2023[68] China 2021-2023	N=236 65.1 (8.9) 66.0% Primary TKR, all N=57 68 58% Primary TKR, all eligible for Triathlon prosthesis N=266 70 (9.9), range 41-90 64% Primary TKR, all 45+ N=470 63.4 (7.4)	WOMAC pain 12 months WOMAC pain 3, 12, 24 months VAS/NRS pain 6 months	both the WOMAC pain and function scores (scaled to 100) WOMAC pain score of >75 Worse or no change in WOMAC pain of 14 point (based on MCID) High loss to follow up rate NRS score of ≥1 at rest and/or on movement

*Abbreviations: PASS (Patient Acceptable Symptom State), MCID (Minimal Clinically Important Difference)

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Figure S3.1. Mean age and their standard deviations reported in the individual studies. Range of age was plotted as blue bars.



S3.2 Proportion of females

Figure S3.2. Proportion of females reported in the individual studies





Figure S3.3. Data collection timeframe in the individual studies.



S3.4 Proportions of lost to follow-ups and revisions

Figure S3.4. Favourable and unfavourable pain outcomes and reasons of missing data reported in 3, 6, 12, and 24 months (represented in sub-plots A, B, C, and D, respectively) in TKR studies.

S4. Traffic light plot of the risk of bias assessments in TKR studies

The corresponding domains in the figures are:

- D1: Was the study's target population a close representation of the national population in relation to relevant variables?
- D2: Was the sampling frame a true or close representation of the target population?
- D3: Was some form of random selection used to select the sample, OR was a census undertaken?
- D4: Was the likelihood of nonresponse bias minimal?
- D5: Were data collected directly from the subjects (as opposed to a proxy)?
- D6: Was an acceptable case definition used in the study?
- D7: Was the study instrument that measured the parameter of interest shown to have validity and reliability?
- D8: Was the same mode of data collection used for all subjects?
- D9: Was the length of the shortest prevalence period for the parameter of interest appropriate?
- D10: Were the numerator(s) and denominator(s) for the parameter of interest appropriate?

Study	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Overall
Attal 2014			\bigcirc								0
Birch 2019			\bigcirc	\bigcirc							
Brander 2003			\bigcirc								\bigcirc
Dursteler 2021			\bigcirc								\bigcirc
Grosu 2016			\bigcirc	\bigcirc							
Kim 2015			\bigcirc								\bigcirc
Lavand'homme 2014			\bigcirc								\bigcirc
Lee 2022			\bigcirc				0				\bigcirc
Nishimoto 2023			\bigcirc								\bigcirc
Phillips 2014			\bigcirc								\bigcirc
Solberg 2023			\bigcirc	\bigcirc			\bigcirc				
- Tang 2023			\bigcirc								\bigcirc
Terradas-Monlior 2024			\bigcirc								\bigcirc
Vuorenmaa 2008			\bigcirc								\bigcirc
Wylde 2019			\bigcirc								\bigcirc

S4.1 TKR studies (3 months)

S4.2 TKR studies (6 months)

Study	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Overall	
Aso 2020			0								\bigcirc	
Attal 2014			0								\bigcirc	
Brander 2003			0		•						\bigcirc	
Buvanendran 2019			0								\bigcirc	
- Chodor and Kruczynski 2022			\bigcirc				\bigcirc				\bigcirc	
Dursteler 2021			0								\bigcirc	
Edwards 2022			0	\bigcirc		•						
Grosu 2016			0	\bigcirc	۲							
Heath 2021			\bigcirc	\bigcirc		•						
Jones 2000			\bigcirc								\bigcirc	
Khalid 2021			0	\bigcirc								
Kurien 2018			\bigcirc		•						\bigcirc	
Leung 2019			\bigcirc				\bigcirc				\bigcirc	Yes
Mekkawy 2023			\bigcirc				\bigcirc					O No
Nishimoto 2023			0								\bigcirc	High
Noiseux 2014			0			•					\bigcirc	Moderate
Phillips 2014			0		•	•					\bigcirc	
Priol 2023			0	\bigcirc								
Pua 2019			\bigcirc								\bigcirc	
Quintana 2006			\bigcirc								\bigcirc	
Rice 2018			\bigcirc		•	•					\bigcirc	
Sideris 2022			\bigcirc		۲	•	•	۲		•	\bigcirc	
Stephens 2002			\bigcirc								\bigcirc	
Terradas-Monllor 2024			0								\bigcirc	
Thomazeau 2016		•	Ó		۲	Ó	۲	۲	•	۲		
van der Wees 2017	Ó		Ō	Ō		Ó						
Waimann 2014			\bigcirc		•				۲		\bigcirc	
Yan 2023			0				0					

S4.3 TKR studies (12 months)

-												
Study	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Overall	
Alzahrani TWH cohort 2011			\bigcirc					•	•		\bigcirc	
Aso 2020			\bigcirc								\bigcirc	
Attal 2014			\bigcirc								\bigcirc	
Baker 2007			\bigcirc								\bigcirc	
Bell 2023			\bigcirc								\bigcirc	
Birch 2019			\bigcirc	\bigcirc								
Brander 2003			\bigcirc								\bigcirc	
Buus 2022			\bigcirc								\bigcirc	
Clement 2014			\bigcirc				\bigcirc				\bigcirc	
Cole 2022			\bigcirc	\bigcirc								
Dave 2017			\bigcirc								\bigcirc	
Dowsey 2012			\bigcirc				\bigcirc					
Escobar and Riddle 2014			\bigcirc	\bigcirc								
Getachew 2021			\bigcirc								\bigcirc	
Grosu 2016			\bigcirc	\bigcirc								
Hardy 2022			\bigcirc								\bigcirc	
Kiran 2015			\bigcirc	\bigcirc								Yes
Kornilov 2018			\bigcirc								\bigcirc	No No
Larsen 2021			\bigcirc	\bigcirc								High
Latijnhouwers 2022			\bigcirc	\bigcirc								Moderate
Lee 2022			\bigcirc				\bigcirc				\bigcirc	
Leung 2019			\bigcirc				\bigcirc				\bigcirc	
Mahdi 2020			\bigcirc	\bigcirc								
Mercurio 2020			\bigcirc								\bigcirc	
Mezey 2023			\bigcirc	\bigcirc								
Musbahi 2023			\bigcirc	\bigcirc								
Оп 2022			\bigcirc	\bigcirc								
Petersen 2015			\bigcirc								\bigcirc	
Petersen 2018			\bigcirc	\bigcirc								
Phillips 2014			\bigcirc								\bigcirc	
Rice 2018			\bigcirc								\bigcirc	
Utrillas-Compaired 2014			\bigcirc				\bigcirc					
van der Wees 2017			\bigcirc	\bigcirc								
W-Dahl 2014			\bigcirc								\bigcirc	
Wylde 2013			\bigcirc								\bigcirc	
Wylde 2019			Ó	Ó				•				

S4.4 TKR studies (24 months)

Study	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Overall
Aso 2020			0								\bigcirc
Attal 2014	۲		0								\bigcirc
Brander 2003	۲		0								\bigcirc
Buvanendran 2019			0								\bigcirc
Chodor and Kruczynski 2022			0				0				\bigcirc
Dursteler 2021			0								\bigcirc
Edwards 2022			0	0				•			
Grosu 2016			0	0							
Heath 2021	۲		0	0				•			
Jones 2000	•	•	Ô								0

S5. Forest plots of univariate meta-analyses in TKR studiesS5.1 TKR studies (3 months)

Study	Instrument		Case	Total	Proportion (95% Crl)	RoB
Solberg 2023	Author own question	+	31	239	13.0 (9.3 to 17.9)	•
Attal 2014	BPI	·	45	89	50.6 (40.3 to 60.8)	0
Nishimoto 2023	KOOS pain		16	68	23.5 (14.9 to 35.0)	0
Birch 2019	OKS pain	H	88	589	14.9 (12.3 to 18.1)	
Lee 2022	Pain disturbing sleep	— — —	69	172	40.1 (33.1 to 47.6)	?
Brander 2003	VAS/NRS pain	— •—–i	26	116	22.4 (15.7 to 30.9)	?
Dursteler 2021	VAS/NRS pain	⊢ −−1	87	170	51.2 (43.7 to 58.6)	0
Grosu 2016	VAS/NRS pain	⊢ •−−1	11	114	9.6 (5.4 to 16.6)	•
Kim 2015	VAS/NRS pain	⊢ •−−	16	94	17.0 (10.7 to 26.0)	0
Lavand'homme 2014	VAS/NRS pain	H	12	128	9.4 (5.4 to 15.8)	0
Phillips 2014	VAS/NRS pain	⊢ •−−−−	26	96	27.1 (19.1 to 36.8)	0
Tang 2023	VAS/NRS pain	→− →	37	196	18.9 (14.0 to 25.0)	0
Terradas-Monllor 2024	VAS/NRS pain	—	31	115	27.0 (19.6 to 35.8)	2
Vuorenmaa 2008	VAS/NRS pain	⊢ •−−−−	9	51	17.6 (9.4 to 30.6)	0
Wylde 2019	WOMAC pain		42	266	15.8 (11.9 to 20.7)	0
Random-effect	ts model	-	546	2503	21.9 (15.7 to 29.6)	
Heterogeneity (tau ²): 0.51 (S	95% Crl 0.18 to 1.1)					
		0 25 50 75 Proportion (%)	100			

S5.2 TKR studies (6 months)

Study	Instrument		Case	Total	Proportion (95% Crl)	RoB
Chodor and Kruczynski 2022	Author own question	⊢_ ∎]	11	69	15.9 (9.1 to 26.5)	0
Leung 2019	Author own question	H=	10	243	4.1 (2.2 to 7.5)	0
Attal 2014	BPI	· · · · · · · · · · · · · · · · · · ·	32	89	36.0 (26.7 to 46.4)	0
Edwards 2022	BPI	⊢ •−-	24	248	9.7 (6.6 to 14.0)	•
Heath 2021	EQ 5D 5L pain/discomfort	н	1099	8299	13.2 (12.5 to 14.0)	•
Nishimoto 2023	KOOS pain	⊢ •−−−+	12	68	17.6 (10.3 to 28.6)	0
Khalid 2021	OKS pain	•	43702	531790	8.2 (8.1 to 8.3)	
Pua 2019	OKS pain	H	350	5325	6.6 (5.9 to 7.3)	0
Aso 2020	VAS/NRS pain	⊢∙−−	20	234	8.5 (5.6 to 12.9)	0
Brander 2003	VAS/NRS pain		21	116	18.1 (12.1 to 26.2)	0
Buvanendran 2019	VAS/NRS pain	⊢ •−−	34	296	11.5 (8.3 to 15.6)	0
Dursteler 2021	VAS/NRS pain	⊢ •−−1	86	170	50.6 (43.1 to 58.0)	0
Grosu 2016	VAS/NRS pain	⊢ •−−−1	7	114	6.1 (3.0 to 12.3)	•
Kurien 2018	VAS/NRS pain		14	50	28.0 (17.3 to 41.9)	0
Mekkawy 2023	VAS/NRS pain	⊢ •−−−	11	112	9.8 (5.5 to 16.9)	
Noiseux 2014	VAS/NRS pain	⊢ •──	31	215	14.4 (10.3 to 19.8)	0
Phillips 2014	VAS/NRS pain	⊢ •−−−1	19	96	19.8 (13.0 to 29.0)	0
Priol 2023	VAS/NRS pain	⊢ •−−1	14	129	10.9 (6.5 to 17.5)	•
Rice 2018	VAS/NRS pain	H	60	300	20.0 (15.9 to 24.9)	0
Sideris 2022	VAS/NRS pain	⊢ •−−−]	15	179	8.4 (5.1 to 13.4)	0
Terradas-Monllor 2024	VAS/NRS pain	⊢ •−−−	21	115	18.3 (12.2 to 26.4)	0
Thomazeau 2016	VAS/NRS pain	⊢ •−−1	30	109	27.5 (20.0 to 36.6)	•
van der Wees 2017	VAS/NRS pain	H=H	41	704	5.8 (4.3 to 7.8)	•
Yan 2023	VAS/NRS pain		102	470	21.7 (18.2 to 25.7)	
Jones 2000	WOMAC pain	H	54	292	18.5 (14.4 to 23.4)	0
Quintana 2006	WOMAC pain	⊢ •	199	792	25.1 (22.2 to 28.3)	0
Stephens 2002	WOMAC pain	⊢− −−1	11	68	16.2 (9.2 to 26.9)	0
Waimann 2014	WOMAC pain	⊢ •	14	236	5.9 (3.5 to 9.8)	0
Random-effects Heterogeneity (tau ²): 0.	model 51 (95% Crl 0.26 to 0.88)	⊢ ◆────	46044	550928	14.1 (10.9 to 17.9)	
		0 25 50	75 100			
		Proportion (%)				

S5.3 TKR studies (12 months)

Study	Instrument		Case	Total	Proportion (95% Crl)	RoB
Clement 2014	Author own question	H=	64	578	11.1 (8.8 to 13.9)	0
Leung 2019	Author own question	H 	8	243	3.3 (1.7 to 6.4)	0
Attal 2014	BPI	· · · · · · · · · · · · · · · · · · ·	26	89	29.2 (20.7 to 39.5)	0
Getachew 2021	BPI	·	74	206	35.9 (29.7 to 42.7)	0
Dowsey 2012	IKSS pain	H	140	478	29.3 (25.4 to 33.5)	
Bell 2023	KOOS pain	*	433	5564	7.8 (7.1 to 8.5)	0
Mahdi 2020	KOOS pain	i=-1	27	615	4.4 (3.0 to 6.3)	
Orr 2022	KOOS pain	H	845	7476	11.3 (10.6 to 12.0)	•
W-Dahl 2014	KOOS pain		105	2736	3.8 (3.2 to 4.6)	0
Utrillas-Compaired 2014	KSS pain	H	12	215	5.6 (3.2 to 9.6)	
Baker 2007	OKS pain		1583	9417	16.8 (16.1 to 17.6)	0
Birch 2019	OKS pain	HHHH	58	589	9.8 (7.7 to 12.5)	۲
Buus 2022	OKS pain	H	94	217	43.3 (36.9 to 50.0)	0
Cole 2022	OKS pain	H=1	70	1025	6.8 (5.4 to 8.5)	
Kiran 2015	OKS pain	H=	57	608	9.4 (7.3 to 12.0)	
Lee 2022	Pain disturbing sleep	H	11	172	6.4 (3.6 to 11.2)	0
Aso 2020	VAS/NRS pain	H	20	234	8.5 (5.6 to 12.9)	0
Brander 2003	VAS/NRS pain		15	116	12.9 (7.9 to 20.3)	2
Grosu 2016	VAS/NRS pain	H	10	114	8.8 (4.8 to 15.5)	
Hardy 2022	VAS/NRS pain		24	111	21.6 (14.9 to 30.2)	0
Kornilov 2018	VAS/NRS pain	·	18	100	18.0 (11.6 to 26.8)	0
Larsen 2021	VAS/NRS pain	H	13	185	7.0 (4.1 to 11.7)	•
Latijnhouwers 2022	VAS/NRS pain		99	282	35.1 (29.8 to 40.9)	
Mercurio 2020	VAS/NRS pain		11	45	24.4 (14.1 to 39.0)	0
Petersen 2015	VAS/NRS pain	·	17	78	21.8 (14.0 to 32.3)	0
Petersen 2018	VAS/NRS pain		25	200	12.5 (8.6 to 17.8)	
Phillips 2014	VAS/NRS pain	·	15	96	15.6 (9.6 to 24.3)	0
Rice 2018	VAS/NRS pain	H 	45	300	15.0 (11.4 to 19.5)	0
van der Wees 2017	VAS/NRS pain	H+1	31	704	4.4 (3.1 to 6.2)	•
Alzahrani TWH cohort 2011	WOMAC pain	⊢ •−1	55	482	11.4 (8.9 to 14.6)	0
Dave 2017	WOMAC pain	1	26	267	9.7 (6.7 to 13.9)	0
Escobar and Riddle 2014	WOMAC pain	H	270	1616	16.7 (15.0 to 18.6)	
Mezey 2023	WOMAC pain		21	101	20.8 (14.0 to 29.8)	
Musbahi 2023	WOMAC pain	H	96	575	16.7 (13.9 to 20.0)	
Wylde 2013	WOMAC pain		15	57	26.3 (16.5 to 39.2)	0
Wylde 2019	WOMAC pain	H = -1	14	266	5.3 (3.1 to 8.7)	•
Random-effects Heterogeneity (tau ²): 0.61 (95	model % Crl 0.34 to 0.98)	· · · · · · · · · · · · · · · · · · ·	4447	36157	12.6 (9.9 to 15.9)	
		Proportion (%)	100			

S5.4 TKR studies (24 months)

Study	Instrument				Case	Total	Proportion (95% Crl)	RoB
Singh 2014	Author own question	i i			499	7229	6.9 (6.3 to 7.5)	?
Tian 2022	Author own question	H=	H		228	721	31.6 (28.3 to 35.1)	?
Dowsey 2012	IKSS pain		4		137	478	28.7 (24.8 to 32.9)	
Lyman 2018	KOOS pain				289	3815	7.6 (6.8 to 8.5)	
Kiran 2015	OKS anchoring question	H			61	608	10.0 (7.9 to 12.7)	ē
Leppanen 2021	VAS/NRS pain	⊢■→			50	205	24.4 (19.0 to 30.7)	?
Lundblad 2008	VAS/NRS pain		+		15	69	21.7 (13.6 to 33.0)	?
Ghomrawi 2017	WOMAC pain	⊢∎!			40	247	16.2 (12.1 to 21.3)	2
Vina 2020	WOMAC pain	⊢∎⊣			36	315	11.4 (8.4 to 15.4)	?
Wylde 2019	WOMAC pain	+=			21	266	7.9 (5.2 to 11.8)	?
Random-e	ffects model				1376	13953	14.6 (9.4 to 22.4)	
Heterogeneity (tau ²): 0.	51 (95% Crl 0.15 to 1.32)							
		0 25	50 Proportion (%)	75	100			

S6. Table of multivariate and univariate meta-analysis results in TKR studies

	Multivariate n	neta-analysis	Univariate meta-analysis			
Time	Median (95% CrI)	tau² (95% CrI)	Median (95% Crl)	tau² (95% CrI)		
3 months	21.2	0.49	21.9	0.51		
	(16.9 to 26.4)	(0.28 to 0.91)	(15.6 to 29.4)	(0.18 to 1.1)		
6 months	14.6	0.56	14.1	0.51		
	(11.9 to 17.8)	(0.34 to 0.91)	(10.9 to 17.9)	(0.27 to 0.9)		
12 months	12.6	0.63	12.6	0.61		
	(10.3 to 15.5)	(0.41 to 0.99)	(9.9 to 15.9)	(0.35 to 0.99)		
24 months	14.2	0.58	14.6	0.52		
	(10 to 20.1)	(0.25 to 1.55)	(9.5 to 22.4)	(0.16 to 1.35)		

S7. Meta-regression analyses in TKR studies

S7.1 Mean age

Time	No. studies	slope	intercept
3 months	15	0.133	-1.272
6 months	28	0.082	-1.851
12 months	34	-0.029	-1.942
24 months	9	-0.073	-1.886

S7.2 Proportion of females

Time	No. studies	slope	intercept
3 months	15	0.009	-1.273
6 months	28	-0.040	-1.697
12 months	36	-0.006	-1.939
24 months	10	0.045	-1.798

S7.3 Sample sizes

Time	No. studies	slope	intercept
3 months	15	-0.001	-1.269
6 months	28	0.000	-1.785
12 months	36	0.000	-1.936
24 months	10	0.000	-1.750

S8. Subgroup analyses in TKR studies

- Geographic region (categorical; North America, Asia, Europe, and Australia)
- Data source (categorical; surgeons, single hospital, multi-centre, and national registry
- Pain outcomes instruments (categorical; multidimensional, e.g. WOMAC pain, simple, e.g. VAS/NRS and EQ-5D 5L, and not validated, e.g. author's own questionnaires)
- Cut-off definitions (categorical; based on MCID, based on PASS, based on pain intensity, e.g. specific post-operative VAS values, based on functional impact, e.g. night pain, pain on movement, or limiting daily life, based on symptom improvement, e.g. no change or increase in pain from pre-operative)

S8.1 Geographical regions

Subgroup	No. Studies	Median (95% Crl)	tau ² (95% Crl)					
		3 Months						
Asia	4	24.26 (11.85 to 42.3)	0.32 (0 to 2.34)					
Europe	9	22.17 (12.42 to 35.18)	0.77 (0.19 to 2.17)					
North America	2	16.63 (0.92 to 81.83)	0.21 (0 to 31.7)					
6 Months								
Asia	5	9.91 (4.04 to 21.69)	0.64 (0.06 to 3.19)					
Australia	2	15.53 (1.23 to 73.87)	0.19 (0 to 23.85)					
Europe	12	17.99 (10.88 to 27.3)	0.77 (0.27 to 1.85)					
North America	9	11.87 (8.87 to 15.58)	0.13 (0 to 0.45)					
12 Months								
Asia	3	5.81 (2.2 to 12.88)	0.12 (0 to 2.76)					
Australia	2	21.45 (0.1 to 98.64)	0.73 (0 to 97.26)					
Europe	25	13.54 (9.91 to 18.16)	0.72 (0.37 to 1.29)					
North America	6	11.15 (8.31 to 14.9)	0.09 (0.01 to 0.4)					
	2	24 Months						
Asia	1	31.36 (28.02 to 34.79)	NA					
Australia	1	28.29 (24.49 to 32.56)	NA					
Europe	4	14.29 (5.86 to 32.4)	0.47 (0.03 to 3.51)					
North America	4	9.56 (5.19 to 17.04)	0.2 (0 to 1.45)					

S8.2 Setting

Subgroup	No. Studies	Median (95% Crl)	tau ² (95% Crl)					
3 Months								
Other	1	26.44 (19.1 to 34.38)	NA					
Single hospital	8	25.41 (15.64 to 38.72)	0.55 (0.13 to 1.73)					
Surgeon	6	16.89 (8.43 to 29.76)	0.55 (0.07 to 2.2)					
6 Months								
Multicentre	6	13.84 (7.93 to 22.5)	0.35 (0.04 to 1.41)					
Other	2	18.34 (7.93 to 37.29)	0.02 (0 to 2.68)					
Registry	1	8.22 (8.14 to 8.29)	NA					
Single hospital	16	15.03 (9.79 to 21.64)	0.73 (0.3 to 1.55)					
Surgeon	3	10.82 (3.35 to 30.39)	0.26 (0 to 5.13)					
12 Months								
Multicentre	12	11.29 (7.37 to 16.83)	0.56 (0.19 to 1.31)					
Registry	1	16.80 (16.07 to 17.57)	NA					

Single hospital	20	13.96 (9.77 to 19.93)	0.77 (0.34 to 1.47)				
Surgeon	3	8.93 (4.2 to 16.32)	0.05 (0 to 1.6)				
24 Months							
Multicentre	1	11.50 (8.14 to 15.03)	NA				
Single hospital	9	14.98 (9.11 to 23.7)	0.57 (0.16 to 1.54)				

S8.3 Pain outcome instruments

Subgroup	No. Studies	Median (95% Crl)	tau ² (95% Crl)					
3 Months								
Multidimensional	5	26.76 (12.16 to 49.19)	0.7 (0.09 to 3.37)					
Not validated	1	12.98 (9.3 to 17.9)	NA					
Simple	9	20.6 (13.08 to 31.41)	0.5 (0.11 to 1.47)					
6 Months								
Multidimensional	9	13.68 (8.49 to 22.5)	0.56 (0.14 to 1.57)					
Not validated	2	7.65 (0 to 99.79)	1.72 (0 to 219.88)					
Simple	17	15.15 (10.99 to 20.57)	0.49 (0.2 to 1.03)					
12 Months								
Multidimensional	21	12.67 (8.95 to 17.66)	0.72 (0.33 to 1.34)					
Not validated	2	6.51 (0 to 98.5)	1.52 (0 to 166.77)					
Simple	13.91 (9.63 to 19.73)	0.44 (0.14 to 1.02)						
24 Months								
Multidimensional	6	12.39 (6.86 to 20.55)	0.41 (0.07 to 1.58)					
Not validated	2	15.65 (0 to 99.99)	3.63 (0.07 to 399.6)					
Simple	2	23.53 (8.04 to 48)	0.02 (0 to 4.48)					

S8.4 Cut-off definitions

Subgroup	No. Studies	Median (95% Crl)	tau ² (95% Crl)
	3 Mont	hs	
Based on functional impact	1	40.1 (33.1 to 47.6)	NA
Based on MCID	2	17.91 (4.01 to 63.34)	NA
Based on pain intensity	10	21.61 (13.37 to 33.15)	0.66 (0.18 to 1.74)
Based on symptom improvement	2	18.26 (0.26 to 95.83)	NA
	6 Mont	hs	
Based on functional impact	1	15.9 (9.1 to 26.5)	NA
Based on MCID	3	14.38 (1.88 to 56.47)	1 (0.05 to 13.77)
Based on pain intensity	21	15.26 (11.63 to 19.96)	0.48 (0.23 to 0.92)
Based on symptom improvement	3	6.75 (1.68 to 26.53)	0.44 (0 to 7.44)
	12 Mon	ths	
Based on functional impact	1	6.4 (3.6 to 11.2)	NA
Based on MCID	5	15.77 (5.83 to 36.93)	0.92 (0.13 to 4.38)
Based on pain intensity	19	14.34 (10.16 to 19.75)	0.61 (0.26 to 1.19)
Based on PASS	2	13.7 (1.08 to 66.8)	NA
Based on symptom improvement	9	8.86 (5.08 to 15.27)	0.63 (0.15 to 1.81)
	24 Mon	ths	
Based on functional impact	1	31.6 (28.3 to 35.1)	NA
Based on MCID	3	10.88 (4.18 to 25.04)	0.22 (0 to 3.32)
Based on pain intensity	4	18.24 (6.02 to 43.02)	0.75 (0.08 to 5.12)
Based on symptom improvement	2	9.15 (2.73 to 24.14)	NA

S9. Doi plots and the LFK indexes in TKR studies S9.1 TKR studies (3 months)







S9.3 TKR studies (12 months)



S9.4 TKR studies (24 months)



S10. Sensitivity analyses

In the sensitivity analysis, we excluded the following studies based on their unique clinical characteristics:

- Tang 2023 (impact on 3 months results only)
- Leppanen 2021 (impact on 24 months results only)
- Fast track studies (impact on 3 and 12 months results only)
- Mekkawy 2023 and Yan 2023 (impact on 6 months results only)
- Studies on TKR or UKR operations
- Studies with more than 20% lost to follow-up
- High risk of bias studies

Name	No. studies	Median (95% Crl)	tau² (95% Crl)
	3 Mor	oths	
Excluding Tang 2023	14	22.12 (15.4 to 30.2)	0.55 (0.19 to 1.21)
Excluding Fast track studies	14	22.56 (15.96 to 30.84)	0.53 (0.17 to 1.18)
Excluding TKR or UKR studies	12	23.68 (16.36 to 33.17)	0.53 (0.17 to 1.29)
Excluding studies with > 20% loss to follow-up	11	26.13 (18.08 to 36.46)	0.49 (0.14 to 1.25)
Excluding studies with overall high risk of bias	12	25.01 (17.87 to 34.74)	0.48 (0.16 to 1.17)
	6 Mor	iths	
Excluding Mekkawy 2023 and Yan 2023	26	13.97 (10.74 to 18.13)	0.54 (0.27 to 0.95)
Excluding TKR or UKR studies	26	14.24 (10.88 to 18.46)	0.54 (0.27 to 0.95)
Excluding studies with > 20% loss to follow-up	19	16.78 (12.37 to 22.52)	0.52 (0.22 to 1.03)
Excluding studies with overall high risk of bias	19	15.63 (11.25 to 21.19)	0.58 (0.24 to 1.12)
	12 Mo	nths	
Excluding Fast track studies	34	12.15 (9.5 to 15.15)	0.55 (0.3 to 0.91)
Excluding TKR or UKR studies	35	12.72 (9.85 to 16)	0.63 (0.35 to 1.01)
Excluding studies with > 20% loss to follow-up	19	15.3 (11.09 to 21.01)	0.58 (0.23 to 1.16)
Excluding studies with overall high risk of bias	20	14.37 (10.14 to 19.49)	0.65 (0.28 to 1.23)
	24 Mo	nths	
Excluding Leppanen 2021	9	13.78 (8.33 to 21.28)	0.52 (0.15 to 1.45)
Excluding TKR or UKR studies	9	13.18 (8.59 to 20.26)	0.42 (0.11 to 1.18)
Excluding studies with > 20% loss to follow-up	6	18.74 (9.79 to 33.5)	0.59 (0.11 to 2.29)
Excluding studies with overall high risk of bias	7	15.28 (8.68 to 26.24)	0.53 (0.12 to 1.78)

*Abbreviation: TKR: Total Knee Replacement; UKR: Unicompartmental Knee Replacement

S11. Characteristics of THR studies

Study	Operation	Pain measure	Definition of			
Country	Number of patients		untavourable pain			
Recruitment dates	cruitment dates Age (SD), range		outcome			
Setting	% women		High risk of blas concern			
Cleveland Clinic OME Arthroplasty Group 2020[1] USA 2015-2018 6 hospitals	Primary THR, all N=3449 Median 65 (IQR 57-72) 57.4%	HOOS pain 12 months	Less than MCID (15 points)			
Erlenwein 2017[2] Germany 2012 1 hospital	Primary THR, all 18+ N=125 63 (12.6) 58%	NRS pain 6 months	Maximum NRS >3 during previous 4 weeks			
Jones 2000[3] Canada 1995-1997 1 health region	Primary THR, all 40+ N=242 68.2 (11.1) 60%	WOMAC pain 6 months	Moderate/ severe pain defined as a gain of <10 points on the WOMAC pain dimension			
Mezey 2023[4]	Primary THR, all	WOMAC pain	Not exceeding MCID (8.3)			
2019-2020 2 hospitals	68.7 (THR and TKR patients) 69.2%	12 11011115	High loss to follow up rate			
Nikolajsen 2006[5] Denmark 2003 National registry	Primary THR, 18-90 years N=1231 71.6 (8.7) Not reported	Authors' own scale of presence of hip pain and impact on daily life 12-18 months	Pain with moderate, severe or very severe impact on daily life			
Page 2016[6] Canada 2009-2012 1 hospital	Primary THR, all 18-75 N=150 60 (9.2) 48%	Authors' own scale 6 months	Chronic pain if pain rated as "discomforting", "distressing", "horrible," or "excruciating" Concern as RCT analysed			
			as cohort study			
Palazzo 2014[7] France 2009 3 hospitals	Primary THR, all N=129 63.5 (13.5) 49.6%	Author's own residual pain scale 12 months	"To what extent have you obtained a relief or improvement as a result of THA in the following areas?" (from 0: not at all; to 4: completely)			
Quintana 2006[8] Spain 1999-2000 7 hospitals	Primary THR N=784 69.1 48.3%	WOMAC pain 6 months	No improvement in pain greater than MCID (24.55 of 100) using an anchor- based method. Concern for high loss to follow up rate			
Ray 2020[9] Sweden 2008-2015 National registry	THR N= 127,660 68 (10) 56%	EQ-5D VAS pain/discomfort 12 months	Worse or no change in pain/discomfort Concern for high loss to follow up rate			

Singh and Lewallen 2010[10] USA 1993-2005	Primary THR N=9154 65 (13.3) 51%	Authors' own scale: How much pain do you have in your operated hip? None, mild, moderate or severe 24 months	Moderate or severe pain Concerns for high loss to follow up rate
Tang 2023[11] China 2020-2021 1 hospital	Primary THR probably, all 65+. Osteoarthritis or osteonecrosis (not fracture) N=89 72 (range 63-81) 62.5%	NRS pain 3 months	NRS scores ≥4 Note, n and losses to follow up estimated as proportions because n hips and knees reported together

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S11.1 Proportions of lost to follow-ups and revisions



Figure S12.1. Favourable and unfavourable pain outcomes and reasons of missing data in THR studies.

tudy	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Overall
eveland Clinic 2020		•	0				•	•	•	•	0
enwein 2017		٠	0	•		•	•	•	•	•	0
nes 2000			0								\bigcirc
zey 2023			0	\bigcirc							
olajsen 2006			0		•		0	•		•	\bigcirc
ge 2016			0		•		0				
azzo 2014			0				0				
intana 2006			0	\bigcirc				•			
y 2020		•	0	0							
igh and Lewallen 2010		•	0	0			0	•		•	

S12. Traffic light plot of the risk of bias assessments in THR studies