1. Kort klinisk retningslinje vedr.:

Periacetabularosteomi (PAO) for patienter over 45 år med symptomatisk hoftedysplasi.

Anbefaling:

↑ Med svag underliggende dokumentation anbefales at overveje PAO operation på personer over 45 år, uden artrose eller overvægt og med god bevægelighed af hoften (+)( )( )( ).

Anbefalingens styrke er svag og derfor er det arbejdsgruppens opfattelse god klinisk praksis er at kirurgen i det enkelte tilfælde præoperativt grundigt må vurdere om der er konkurrerende risici; artrose (JWS<3mm), overvægt, nedsat bevægelighed samt anden komorbiditet.

2. Udarbejdet af DSHK (Dansk Selskab for Hofte og Knæalloplastikkirurgi). 3. Forfattere: Stig Storgaard Jakobsen (DSHK), Ole Ovesen (DSHK)

4. Godkendt første gang på DOS generalforsamling oktober 2017. Gældende i 4 år fremadrettet herefter.

5. Baggrund for valg af spørgsmål:

Traditionelt har PAO været en behandling for de yngre patienter med symptomatisk hoftedysplasi. Indikationen har været karakteristiske smerter for hoftedysplasi, minimal eller ingen artrose samt radiologiske hoftedysplasi (CE<25^0). Formålet med operationen er at mindske smerter, øge funktionsniveauet samt udskyde en eventuel sekundær artrose. Der har været tvivl om indikationen for PAO ved ældre patienter. Baggrunden er at den negative konsekvens ved en kunstig hofte ikke er så stor som ved yngre patienter. Derudover mistænkes det også at helingspotentialet er ringere, medførende længere rehabilitering, flere komplikationer, samt et dårligere funktionelt resultat.

6. Denne retningslinje omhandler:

PICO spørgsmål

Er der evidens for at patienter over 45 år med symptomatisk hoftedysplasi bør opereres med periacetabular osteotomi eller bør de ikke opereres med en periacetabular osteotomi?

Population:
Personer over 45 år med symptomatisk hoftedysplasi defineret som Center Edge vinkel ad modum Ogata <25^0 samt ind-helet triradiær brusk.

Intervention:

Periacatabular osteotomi

Comparison:

Operation med periacetabular osteotomi under 45 år.

Outcome:

1. Konversion til THA
2. Functional outcome score
3. Komplikation (større), Iatrogen nervelæsion, iatrogen karlæssion, delayed union, psudoartrose, fraktur, DVT/PE)

7. Anbefaling:

Følgende symboler, indikerer styrken af anbefalingerne: ↑↑ = Stærk anbefaling for
↑ = Svag/betinget anbefaling for
↓ = Svag/betinget anbefaling imod

↓↓ = Stærk anbefaling imod

√ God praksis. Anvendes hvor der ikke findes evidens på området, men hvor arbejdsgruppen ønsker at fremhæve særlige aspekter af anerkendt klinisk praksis.

Følgende symboler angiver evidensniveau: (+)(+)(+)(+) = Høj
(+)(+)(+) = Moderat
(+)(+) = Lav

(+) = Meget Lav

↑ Med svag underliggende dokumentation anbefales at overveje PAO operation på personer over 45 år (+)( )( )( ).

Anbefalingens styrke er svag og det er derfor arbejdsgruppens opfattelse at kirurgen i det enkelte tilfælde præoperativt grundigt må vurdere konkurrerende risici. Såfremt der ikke er sekundær artrose (evt. vurderet med supplerende billeddiagnostik), overvægt og patienten i øvrigt ikke har anden betydende komorbiditet kan man med et godt resultat udføre PAO på patienter ældre en 45 år.

8. Litteratur

Oprindelig søgning

Evidensgrundlaget for det fokuserede spørgsmål er følgende. Guideline: 0
Systematiske reviews: 0
Randomiserede kliniske studier: 0

Observersionelle Studier: 10

Supplerende søgning

Evidensgrundlaget for det fokuserede spørgsmål er følgende. Guideline: 0
Systematiske reviews: 1
Randomiserede kliniske studier: 0

Observersionelle Studier: 11

Kvaliteten af de observationelle studier er vurderet med ROBINS-I værktøjet af to uafhængige bedømmere. Uoverensstemmelser er drøftet i gruppen til enighed. Se ROBINS-I vurderingen (Bilag 3).

9. Evidens:

Evidensen er præsenteret for hvert outcome i SoF tabellen (bilag 4).

10. Arbejdsgruppens overvejelser:

På baggrund af den tilgængelige litteratur kan man konstatere at konversions raten til THA stiger med alderen. Det vil sige at jo ældre man er, når man modtager en PAO-operation jo kortere tid går der i gennemsnit før man modtager en kunstig hofte. I de foreliggende observationelle studier har der væres confoundere relateret til alder, specielt i form af sekundær artrose. Der tegner sig ikke noget klart billede, men flere studier har dog påpeget at hazard ratio ved stigende alder, falder når der justeres for kendte risikofaktorer som f.eks. artrose, kongrurens, tidligere kirurgi mm.

På grund af sparsom evidens i den tilgængelige litteratur er det ikke muligt at konkludere om patienter ældre end 45 år har lige så god klinisk outcome af PAO, som patienter yngre end 45 år. Der er dog studier der viser en forbedret PROM ved den ældre kategori samt en større forbedring i PROM forhold til yngre patienter.

Det er heller ikke muligt entydigt at vurdere om komplikationsraten er højere for patienter ældre en 45 år end for patienter yngre end 45 år. Der er studier der viser en øget risiko for alvorlig komplikation på per- og postoperativt efter en PAO.

11. Balancen mellem effekt og skadevirkninger:

Arbejdsgruppen vurderer at gevinsten ved PAO falder med patientens alder, da der for den ældre patientgruppe eksisterer et godt alternativ nemlig en kunstig hofte.

12. Værdier og præferencer:

Arbejdsgruppen forventer at patienten ønsker et varigt højt funktionsniveau uden smerter opnået ved en enkelt operation. Endvidere forventes det at patienten altid vil foretrække at undgå at blive påført kar- og nerveskade, uintenderet fissur eller opleve langsom knogleheling eller infektion.

13. Kvaliteten af evidensen:

Kvaliteten af evidensen er fortsat samlet set meget lav (+)( )( )( ). De videnskabelige studier omhandlende ovenstående PICO spørgsmål er observationelle og der eksisterer ingen randomiserede studier eller guidelines. Der eksisterer et veludført systematisk review af de samme observationelle studier. Dermed er kvaliteten af evidensen lav selvom flere af de observationelle studier er af god kvalitet.

14. Plan for implementering og evaluering af aktuel KKR.

Aktuelt anvendes eksisterende KKR og revideret KKR ændrer kun meget begrænset ved anbefalingen. Ved årlige møder samt i databaser diskuteres og registreres demografi.

15. Andre overvejelser:

16. Summary:

Background
Acetabular Osteotomy is performed with success on young patients with moderate to severe hip disability combined with radiological hip dysplasia defined as an Wiberg Center Edge angle below 250 in combination with an increased Tönnis Acetabular angle.

Purpose / Aim of study
The aim was to evaluate the influence of age on the results following a acetabular osteotomy by evaluating the conversion rate to total hip arthroplasty, the PROM results and, the complication rate.

Materials and Methods
Pubmed and Scofus was search in 2017 (n1054) and 2023 (n961). Dublets and irrelevant papers were excluded after reading the titles and abstracts. The resulting 74/51 papers was read and further 64/39 could be excluded due to different surgical technique and lack of age stratification ending up with a body of evidence n10/n12.

Findings / Results
Eleven studies suggested an increased conversion rate to total hip arthroplasty correlated to age and 3 studies suggesting no correlation. Three studies suggested an increased improvement on PROM related to increasing age. Two studies suggested the opposite and 2 studies was inconclusive. One study suggested an increased risk of surgical complications correlated to increasing age.

Conclusions
The ideal patient should be below 45 years old, without any signs of arthrosis. It appears though, that patients older than 45 years can expect a significantly increased PROM, but also with an increased risk of conversion to a total hip arthroplasty.

17. Bilag

Bilag 1: Søgestrategi og søgestreng
Bilag 2: Flowskema over litteraturudvægelse
Bilag 3: ROBINS-I samt AMSTAR-2
Bilag 4: Summary of Findings tabel

18. Litteraturliste

1. One-third of Hips After Periacetabular Osteotomy Survive 30 Years With Good Clinical Results, No Progression of Arthritis, or Conversion to THA. Lerch TD, Steppacher SD, Liechti EF, Tannast M, Siebenrock KA. Clin Orthop Relat Res. 2017 Apr;475(4):1154-1168
2. Survivorship of the Bernese Periacetabular Osteotomy: What Factors are Associated with Long-term Failure? Wells J, Millis M, Kim YJ, Bulat E, Miller P, Matheney T. Clin Orthop Relat Res. 2017 Feb;475(2):396- 405
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13. Risk Factors for Composite Failure of Hip Dysplasia Treated With Periacetabular Osteotomy: A Minimum 10-Year Follow-up. Willey MC, Westermann RW, Glass N, Goetz JE, Aitken H, Fatemi N, Davison J, Miller A, Parker E, Fruehling C, McKinley TO. J Am Acad Orthop Surg. 2022 Apr 15;30(8):e690-e702.
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Int Orthop. 2020 Jun;44(6):1055-1061.
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20. Preoperative incipient osteoarthritis predicts failure after periacetabular osteotomy: 69 hips operated through the anterior intrapelvic approach. Isaksen KF, Roscher EK, Iversen KS, Eitzen I, Clarke-Jenssen J, Nordsletten L, Madsen JE. Hip Int. 2019 Sep;29(5):516-526.
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22. Hip survival after periacetabular osteotomy in patients with acetabular dysplasia, acetabular retroversion, congenital dislocation of the hip, or Legg-Calvé-Perthes disease: a cohort study on 1,501 hips. Rosendahl Kristiansen A, Holsgaard-Larsen A, Bøgehøj M, Overgaard S, Lindberg-Larsen M, Ovesen O. Acta Orthop. 2023 May 10;94:250-256

BILAG 1

Søgestrategi og søgestreng

Der er foretaget søgning efter internationale guidelines i følgende informationskilder: National Guideline Clearingshouse (guideline.gov), Guidelines International Network (g-i-n.net), Scottish Intercollegiate Guidelines Network (sign.ac.uk), Cochrane Library, Statens beredning för medicinsk utvärding (SBU, Sverige), Socialstyrelsen (Sverige), Kunnskabscenteret (Norge) og Medline.

Vi finder ingen guidelines omhandlende emnet.

Der blev først søgt med en traditionel struktureret begrænsende søgning. Det blev klart at flere relevante studier ikke vil kunne findes da PICO spørgsmålet kun var delemne af aktuelle publikation og dermed ikke fuldt søgbare. Derfor blev der valgt en bredere tilgang.

I Pubmed er der søgt Mandag d. 17. April kl 11.16 (n 467):

periacetabular[All Fields] AND ("osteotomy"[MeSH Terms] OR "osteotomy"[All Fields])

I Scopos er der søgt mandag d. 17. April kl 11.32 (n 587)

TITLE-ABS-KEY (periacetabular AND osteotom*)

Disse to søgninger sammenlægges og ud fra titel og abstract bedømmes 74 artikler relevante. Bedømmelsen er foretaget af to uafhængige bedømmere. Uoverensstemmelser er drøftet i gruppen til enighed af alle deltagere.

Ud af de 74 artikler bedømmes 10 relevante for det aktuelle PICO spørgsmål. Bedømmelsen er foretaget af samme to uafhængige bedømmere på bagrund af artiklerne. Uoverensstemmelser er drøftet i gruppen til enighed af alle deltagere.

Der findes ingen systematiske reviews eller randomiserede kliniske studier.

Der er foretaget en supplerende søgning mandag d. 1. Maj 2023.

I Pubmed er der søgt d.1. maj 2023 kl 11.00 (n487)

periacetabular[All Fields] AND ("osteotomy"[MeSH Terms] OR "osteotomy"[All Fields]) ("2017/04/17"[Date - Entry] : "3000"[Date - Entry])

I scofus er der søgt d.1. Maj 2023 kl 11.00 (n475)

TITLE-ABS-KEY ((periacetabular AND osteotom*)) AND PUBYEAR > 2017 AND PUBYEAR > 2017

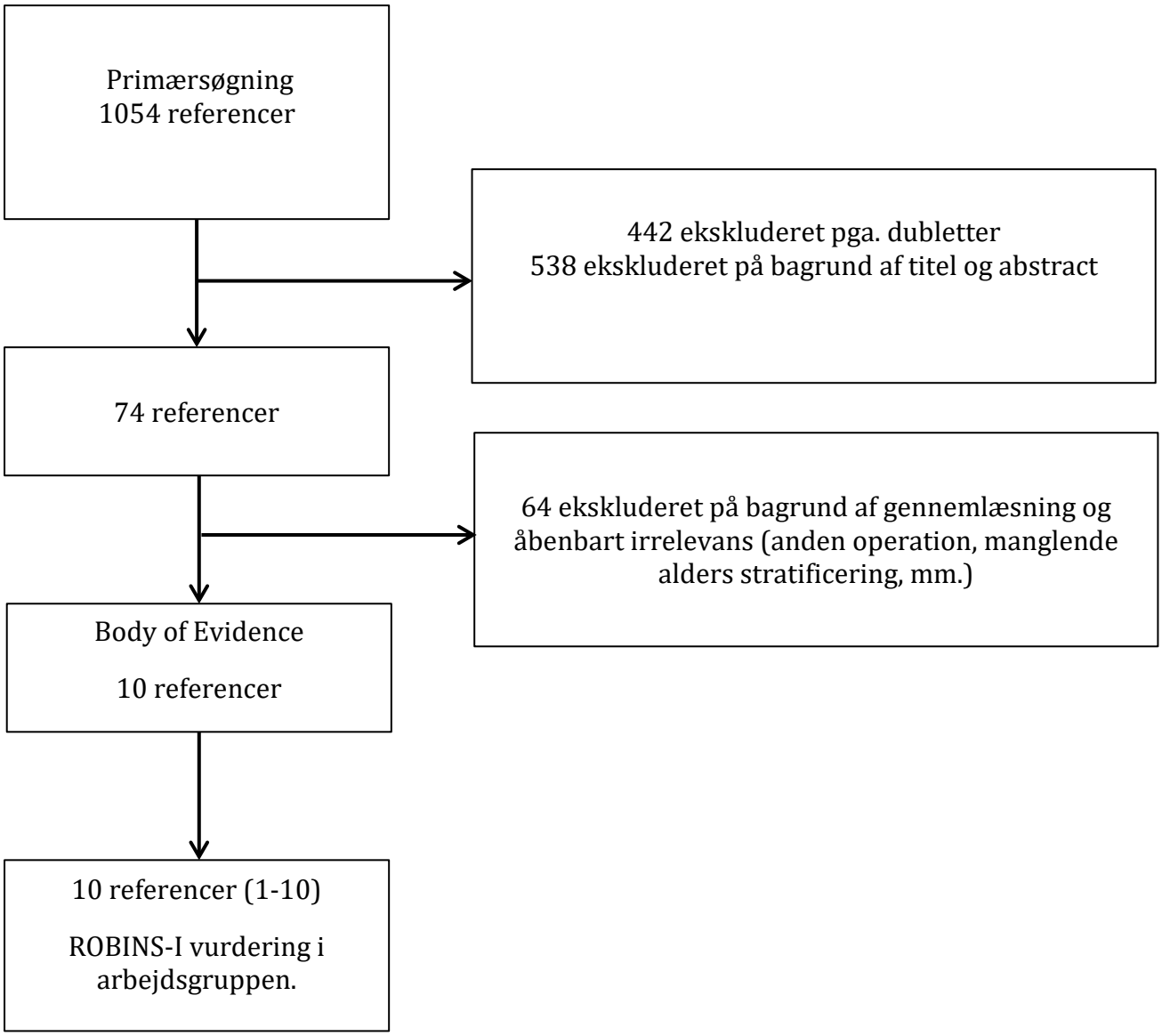
Disse to søgninger sammenlægges og ud fra titel og abstract bedømmes 51 artikler relevante. Bedømmelsen er foretaget af to uafhængige bedømmere. Uoverensstemmelser er drøftet i gruppen til enighed af alle deltagere.

Ud af de 51 artikler bedømmes 12 relevante for det aktuelle PICO spørgsmål. Bedømmelsen er foretaget af samme to uafhængige bedømmere på baggrund af artiklerne. Uoverensstemmelser er drøftet i gruppen til enighed af alle deltagere.

Der findes et systematisk review men ingen randomiserede kliniske studier.

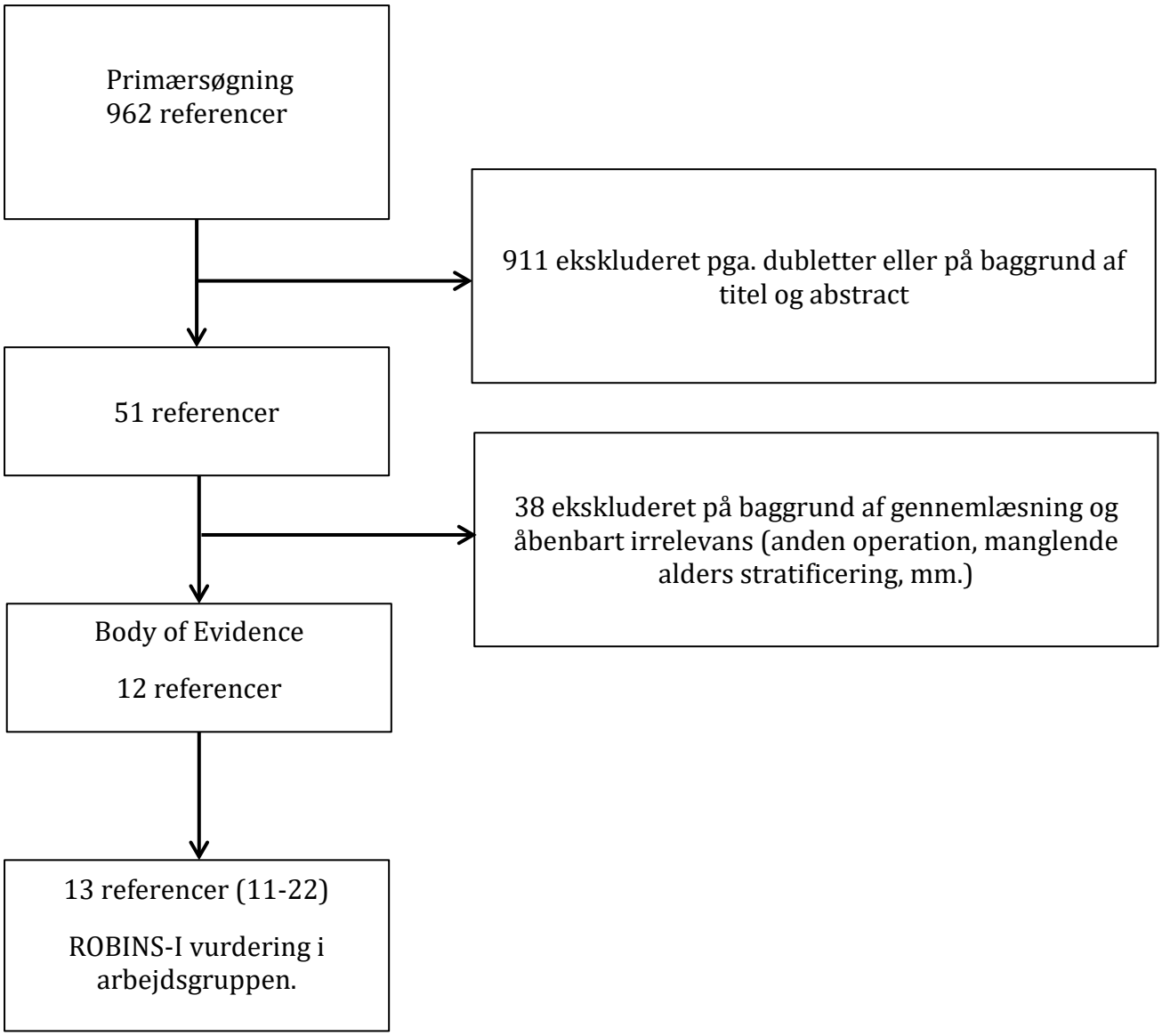
BILAG 2 Flowskema over primær litteraturudvælgelse

Søgning på Pubmed (n467) og Scopos (n587).



BILAG 2 Flowskema over supplerende litteraturudvælgelse

Søgning på Pubmed (n487) og Scopos (n475).



AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both

1. Did the research questions and inclusion criteria for the review include the components of PICO?

For Yes:
- [X] Population
- [X] Intervention
- [X] Comparator group
- [X] Outcome

Optional (recommended)
- [ ] Timeframe for follow-up

- [X] Yes
- [ ] No

2. Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?

For Partial Yes:
The authors state that they had a written protocol or guide that included ALL the following:
- [ ] review question(s)
- [ ] a search strategy
- [ ] inclusion/exclusion criteria
- [ ] a risk of bias assessment

For Yes: [X]
As for partial yes, plus the protocol should be registered and should also have specified:
- [ ] a meta-analysis/synthesis plan, if appropriate, *and*
- [ ] a plan for investigating causes of heterogeneity
- [X] justification for any deviations from the protocol

- [X] Yes
- [ ] Partial Yes
- [ ] No

3. Did the review authors explain their selection of the study designs for inclusion in the review?

For Yes, the review should satisfy ONE of the following:
- [ ] *Explanation for* including only RCTs
- [ ] OR *Explanation for* including only NRSI
- [ ] OR *Explanation for* including both RCTs and NRSI

- [ ] Yes
- [X] No

4. Did the review authors use a comprehensive literature search strategy?

For Partial Yes (all the following):
- [ ] searched at least 2 databases (relevant to research question)
- [ ] provided key word and/or search strategy
- [ ] justified publication restrictions (e.g. language)

For Yes, should also have (all the following):
- [X] searched the reference lists / bibliographies of included studies
- [X] searched trial/study registries
- [ ] included/consulted content experts in the field
- [ ] where relevant, searched for grey literature
- [X] conducted search within 24 months of completion of the review

- [X] Yes
- [ ] Partial Yes
- [ ] No

5. Did the review authors perform study selection in duplicate?

For Yes, either ONE of the following:
- [X] at least two reviewers independently agreed on selection of eligible studies and achieved consensus on which studies to include
- [ ] OR two reviewers selected a sample of eligible studies and achieved good agreement (at least 80 percent), with the remainder selected by one reviewer.

- [X] Yes
- [ ] No

AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both

6. Did the review authors perform data extraction in duplicate?

For Yes, either ONE of the following:

- [X] at least two reviewers achieved consensus on which data to extract from included studies
- [ ] OR two reviewers extracted data from a sample of eligible studies and achieved good agreement (at least 80 percent), with the remainder extracted by one reviewer.

- [X] Yes
- [ ] No

7. Did the review authors provide a list of excluded studies and justify the exclusions?

For Partial Yes:

- [ ] provided a list of all potentially relevant studies that were read in full-text form but excluded from the review

For Yes, must also have:

- [ ] Justified the exclusion from the review of each potentially relevant study

- [X] Yes
- [ ] Partial Yes
- [ ] No

8. Did the review authors describe the included studies in adequate detail?

For Partial Yes (ALL the following):

- [ ] described populations
- [ ] described interventions
- [ ] described comparators
- [ ] described outcomes
- [ ] described research designs

For Yes, should also have ALL the following:

- [X] described population in detail
- [X] described intervention in detail (including doses where relevant)
- [X] described comparator in detail (including doses where relevant)
- [X] described study's setting
- [X] timeframe for follow-up

- [X] Yes
- [ ] Partial Yes
- [ ] No

9. Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?

RCTs

For Partial Yes, must have assessed RoB from

- [ ] unconcealed allocation, *and*
- [ ] lack of blinding of patients and assessors when assessing outcomes (unnecessary for objective outcomes such as all-cause mortality)

For Yes, must also have assessed RoB from:

- [ ] allocation sequence that was not truly random, *and*
- [ ] selection of the reported result from among multiple measurements or analyses of a specified outcome

- [ ] Yes
- [ ] Partial Yes
- [ ] No
- [X] Includes only NRSI

NRSI

For Partial Yes, must have assessed RoB:

- [ ] from confounding, *and*
- [ ] from selection bias

For Yes, must also have assessed RoB:

- [X] methods used to ascertain exposures and outcomes, *and*
- [X] selection of the reported result from among multiple measurements or analyses of a specified outcome

- [X] Yes
- [ ] Partial Yes
- [ ] No
- [ ] Includes only RCTs

10. Did the review authors report on the sources of funding for the studies included in the review?

For Yes

- [ ] Must have reported on the sources of funding for individual studies included in the review. Note: Reporting that the reviewers looked for this information but it was not reported by study authors also qualifies

- [ ] Yes
- [X] No

AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both

11. If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?

RCTs

For Yes:

- ☐ The authors justified combining the data in a meta-analysis
  - ☐ AND they used an appropriate weighted technique to combine study results and adjusted for heterogeneity if present.
  - ☐ AND investigated the causes of any heterogeneity

- ☐ Yes
- ☐ No
- ☒ No meta-analysis conducted

For NRSI

For Yes:

- ☒ The authors justified combining the data in a meta-analysis
  - ☒ AND they used an appropriate weighted technique to combine study results, adjusting for heterogeneity if present
  - ☒ AND they statistically combined effect estimates from NRSI that were adjusted for confounding, rather than combining raw data, or justified combining raw data when adjusted effect estimates were not available
  - ☒ AND they reported separate summary estimates for RCTs and NRSI separately when both were included in the review

- ☒ Yes
- ☐ No
- ☐ No meta-analysis conducted

12. If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?

For Yes:

- ☐ included only low risk of bias RCTs
- ☐ OR, if the pooled estimate was based on RCTs and/or NRSI at variable RoB, the authors performed analyses to investigate possible impact of RoB on summary estimates of effect.

- ☒ Yes
- ☐ No
- ☐ No meta-analysis conducted

13. Did the review authors account for RoB in individual studies when interpreting/ discussing the results of the review?

For Yes:

- ☐ included only low risk of bias RCTs
- ☐ OR, if RCTs with moderate or high RoB, or NRSI were included the review provided a discussion of the likely impact of RoB on the results

- ☒ Yes
- ☐ No

14. Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?

For Yes:

- ☐ There was no significant heterogeneity in the results
- ☐ OR if heterogeneity was present the authors performed an investigation of sources of any heterogeneity in the results and discussed the impact of this on the results of the review

- ☒ Yes
- ☐ No

15. If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?

For Yes:

- ☒ performed graphical or statistical tests for publication bias and discussed the likelihood and magnitude of impact of publication bias

- ☒ Yes
- ☐ No
- ☐ No meta-analysis conducted

AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both

16. Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?

For Yes:

X	The authors reported no competing interests OR	X	Yes
☐	The authors described their funding sources and how they managed potential conflicts of interest	☐	No

To cite this tool: Shea BJ, Reeves BC, Wells G, Thuku M, Hamel C, Moran J, Moher D, Tugwell P, Welch V, Kristjansson E, Henry DA. AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. BMJ. 2017 Sep 21;358:j4008.

The Risk Of Bias In Non-randomized Studies – of Interventions (ROBINS-I) assessment tool

(version for cohort-type studies)

Version 19 September 2016

ROBINS-I tool (Stage I): At protocol stage

Specify the review question

Participants	Ole Ovesen, Stig Storgaard Jakobsen
Experimental intervention	Periacatabular osteotomi over 50 år.
Comparator	Operation med periacetabular osteotomi under 50 år.
Outcomes	1. Patient Related Outcome Score (*eg.* WOMAC; HOOS, OHS, HHS, FJS, SF-36, EQ-5D) 2. Konversion til THA 3. Komplikation (Stor –The Clavien-Dindo Classification of Surgical Complications grade III/IV) samt iatrogen nervelæsion, iatrogen karlæsion)

List the confounding domains relevant to all or most studies

Artrose/degeneration, BMI, Kongruens, Komorbiditet,

List co-interventions that could be different between intervention groups and that could impact on outcomes

Ingen

ROBINS-I tool (Stage II): For each study

Specify a target randomized trial specific to the study

Design	Individually randomized / Cluster randomized / Matched (e.g. cross-over)
Participants	Kristiansen et al. 2023: Hip survival after periacetabular osteotomy in patients with acetabular dysplasia, acetabular retroversion, congenital dislocation of the hip, or Legg-Calvé-Perthes disease: a cohort study on 1,501 hips
Experimental intervention	
Comparator	

Is your aim for this study…?

- ☐ to assess the effect of *assignment to* intervention
- ☐ to assess the effect of *starting and adhering to* intervention

Specify the outcome

Specify which outcome is being assessed for risk of bias (typically from among those earmarked for the Summary of Findings table). Specify whether this is a proposed benefit or harm of intervention.

Specify the numerical result being assessed

In case of multiple alternative analyses being presented, specify the numeric result (e.g. RR = 1.52 (95% CI 0.83 to 2.77) and/or a reference (e.g. to a table, figure or paragraph) that uniquely defines the result being assessed.

Preliminary consideration of confounders

Complete a row for each important confounding domain (i) listed in the review protocol; and (ii) relevant to the setting of this particular study, or which the study authors identified as potentially important.

"Important" confounding domains are those for which, in the context of this study, adjustment is expected to lead to a clinically important change in the estimated effect of the intervention. "Validity" refers to whether the confounding variable or variables fully measure the domain, while "reliability" refers to the precision of the measurement (more measurement error means less reliability).

(i) Confounding domains listed in the review protocol				
Confounding domain	Measured variable(s)	Is there evidence that controlling for this variable was unnecessary?*	Is the confounding domain measured validly and reliably by this variable (or these variables)?	OPTIONAL: Is failure to adjust for this variable (alone) expected to favour the experimental intervention or the comparator?
			Yes / No / No information	Favour experimental / Favour comparator / No information
Artrose/Degeneration	Tönnis grade	No	Yes	Favour comparator
BMI	Weight	No	Yes	No information
Congruency	Sphericity index (Severin)	No	Yes	No Information
Comobidity	Restrictive ambulation	No	No	No information

(ii) Additional confounding domains relevant to the setting of this particular study, or which the study authors identified as important				
Confounding domain	Measured variable(s)	Is there evidence that controlling for this variable was unnecessary?*	Is the confounding domain measured validly and reliably by this variable (or these variables)?	OPTIONAL: Is failure to adjust for this variable (alone) expected to favour the experimental intervention or the comparator?
			Yes / No / No information	Favour experimental / Favour comparator / No information

* In the context of a particular study, variables can be demonstrated not to be confounders and so not included in the analysis: (a) if they are not predictive of the outcome; (b) if they are not predictive of intervention; or (c) because adjustment makes no or minimal difference to the estimated effect of the primary parameter. Note that “no statistically significant association” is not the same as “not predictive”.

Preliminary consideration of co-interventions

Complete a row for each important co-intervention (i) listed in the review protocol; and (ii) relevant to the setting of this particular study, or which the study authors identified as important.

"Important" co-interventions are those for which, in the context of this study, adjustment is expected to lead to a clinically important change in the estimated effect of the intervention.

(i) Co-interventions listed in the review protocol		
Co-intervention	Is there evidence that controlling for this co-intervention was unnecessary (e.g. because it was not administered)?	Is presence of this co-intervention likely to favour outcomes in the experimental intervention or the comparator
NA		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information

(ii) Additional co-interventions relevant to the setting of this particular study, or which the study authors identified as important		
Co-intervention	Is there evidence that controlling for this co-intervention was unnecessary (e.g. because it was not administered)?	Is presence of this co-intervention likely to favour outcomes in the experimental intervention or the comparator
NA		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information

Risk of bias assessment

Responses underlined in green are potential markers for low risk of bias, and responses in red are potential markers for a risk of bias. Where questions relate only to sign posts to other questions, no formatting is used.

Signalling questions	Description	Response options
Bias due to confounding		
1.1 Is there potential for confounding of the effect of intervention in this study? **If N/PN to 1.1:** the study can be considered to be at low risk of bias due to confounding and no further signalling questions need be considered	Y	Y / PY / PN / N
If Y/PY to 1.1: determine whether there is a need to assess time-varying confounding:		
1.2. Was the analysis based on splitting participants' follow up time according to intervention received? **If N/PN**, answer questions relating to baseline confounding (1.4 to 1.6) **If Y/PY**, go to question 1.3.	N	NA / Y / PY / PN / N / NI
1.3. Were intervention discontinuations or switches likely to be related to factors that are prognostic for the outcome? **If N/PN**, answer questions relating to baseline confounding (1.4 to 1.6) **If Y/PY**, answer questions relating to both baseline and time-varying confounding (1.7 and 1.8)		NA / Y / PY / PN / N / NI

Questions relating to baseline confounding only		
1.4. Did the authors use an appropriate analysis method that controlled for all the important confounding domains?	Y	NA / Y / PY / PN / N / NI
1.5. **If Y/PY to 1.4**: Were confounding domains that were controlled for measured validly and reliably by the variables available in this study?	Y	NA / Y / PY / PN / N / NI
1.6. Did the authors control for any post-intervention variables that could have been affected by the intervention?	N	NA / Y / PY / PN / N / NI
Questions relating to baseline and time-varying confounding		
1.7. Did the authors use an appropriate analysis method that controlled for all the important confounding domains and for time-varying confounding?	N	NA / Y / PY / PN / N / NI
1.8. **If Y/PY to 1.7**: Were confounding domains that were controlled for measured validly and reliably by the variables available in this study?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to confounding?	Unpredictable	Favours experimental / Favours comparator / Unpredictable

Bias in selection of participants into the study		
2.1. Was selection of participants into the study (or into the analysis) based on participant characteristics observed after the start of intervention? **If N/PN to 2.1:** go to 2.4	N	Y / PY / PN / N / NI
2.2. **If Y/PY to 2.1**: Were the post-intervention variables that influenced selection likely to be associated with intervention?		NA / Y / PY / PN / N / NI
2.3 **If Y/PY to 2.2**: Were the post-intervention variables that influenced selection likely to be influenced by the outcome or a cause of the outcome?		NA / Y / PY / PN / N / NI
2.4. Do start of follow-up and start of intervention coincide for most participants?	Y	Y / PY / PN / N / NI
2.5. **If Y/PY to 2.2 and 2.3, or N/PN to 2.4**: Were adjustment techniques used that are likely to correct for the presence of selection biases?	Y	NA / Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to selection of participants into the study?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in classification of interventions		
3.1 Were intervention groups clearly defined?	Y	Y / PY / PN / N / NI
3.2 Was the information used to define intervention groups recorded at the start of the intervention?	Y	Y / PY / PN / N / NI
3.3 Could classification of intervention status have been affected by knowledge of the outcome or risk of the outcome?	N	Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to classification of interventions?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias due to deviations from intended interventions		
If your aim for this study is to assess the effect of assignment to intervention, answer questions 4.1 and 4.2		
4.1. Were there deviations from the intended intervention beyond what would be expected in usual practice?	N	Y / PY / PN / N / NI
4.2. **If Y/PY to 4.1**: Were these deviations from intended intervention unbalanced between groups *and* likely to have affected the outcome?	PN	NA / Y / PY / PN / N / NI
If your aim for this study is to assess the effect of starting and adhering to intervention, answer questions 4.3 to 4.6		
4.3. Were important co-interventions balanced across intervention groups?	PY	Y / PY / PN / N / NI
4.4. Was the intervention implemented successfully for most participants?	Y	Y / PY / PN / N / NI
4.5. Did study participants adhere to the assigned intervention regimen?	Y	Y / PY / PN / N / NI
4.6. **If N/PN to 4.3, 4.4 or 4.5**: Was an appropriate analysis used to estimate the effect of starting and adhering to the intervention?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Low	
Optional: What is the predicted direction of bias due to deviations from the intended interventions?	Towards null	

Bias due to missing data		
5.1 Were outcome data available for all, or nearly all, participants?	Y	Y / PY / PN / N / NI
5.2 Were participants excluded due to missing data on intervention status?	N	Y / PY / PN / N / NI
5.3 Were participants excluded due to missing data on other variables needed for the analysis?	N	Y / PY / PN / N / NI
5.4 **If PN/N to 5.1, or Y/PY to 5.2 or 5.3**: Are the proportion of participants and reasons for missing data similar across interventions?	PY	NA / Y / PY / PN / N / NI
5.5 **If PN/N to 5.1, or Y/PY to 5.2 or 5.3**: Is there evidence that results were robust to the presence of missing data?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to missing data?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in measurement of outcomes		
6.1 Could the outcome measure have been influenced by knowledge of the intervention received?	N	Y / PY / PN / N / NI
6.2 Were outcome assessors aware of the intervention received by study participants?	Y	Y / PY / PN / N / NI
6.3 Were the methods of outcome assessment comparable across intervention groups?	Y	Y / PY / PN / N / NI
6.4 Were any systematic errors in measurement of the outcome related to intervention received?	N	Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to measurement of outcomes?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in selection of the reported result		
Is the reported effect estimate likely to be selected, on the basis of the results, from... 7.1. ... multiple outcome *measurements* within the outcome domain?	N	Y / PY / PN / N / NI
7.2 ... multiple *analyses* of the intervention-outcome relationship?	N	Y / PY / PN / N / NI
7.3 ... different *subgroups*?	N	Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to selection of the reported result?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Overall bias		
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the overall predicted direction of bias for this outcome?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

The Risk Of Bias In Non-randomized Studies – of Interventions (ROBINS-I) assessment tool

(version for cohort-type studies)

Version 19 September 2016

ROBINS-I tool (Stage I): At protocol stage

Specify the review question

Participants	Ole Ovesen, Stig Storgaard Jakobsen
Experimental intervention	Periacatabular osteotomi over 50 år.
Comparator	Operation med periacetabular osteotomi under 50 år.
Outcomes	1. Patient Related Outcome Score (*eg.* WOMAC; HOOS, OHS, HHS, FJS, SF-36, EQ-5D) 2. Konversion til THA 3. Komplikation (Stor –The Clavien-Dindo Classification of Surgical Complications grade III/IV) samt iatrogen nervelæsion, iatrogen karlæsion)

List the confounding domains relevant to all or most studies

Artrose/degeneration, BMI, Kongruens, Komorbiditet,

List co-interventions that could be different between intervention groups and that could impact on outcomes

Ingen

ROBINS-I tool (Stage II): For each study

Specify a target randomized trial specific to the study

Design	Individually randomized / Cluster randomized / Matched (e.g. cross-over)
Participants	Yilmaz et al. 2022, Acetabular dysplasia: a comparison of periacetabular osteotomy results of patients older and younger than 35 years
Experimental intervention	
Comparator	

Is your aim for this study…?

☐ to assess the effect of *assignment to* intervention

☐ to assess the effect of *starting and adhering to* intervention

Specify the outcome

Specify which outcome is being assessed for risk of bias (typically from among those earmarked for the Summary of Findings table). Specify whether this is a proposed benefit or harm of intervention.

Specify the numerical result being assessed

In case of multiple alternative analyses being presented, specify the numeric result (e.g. RR = 1.52 (95% CI 0.83 to 2.77) and/or a reference (e.g. to a table, figure or paragraph) that uniquely defines the result being assessed.

Preliminary consideration of confounders

Complete a row for each important confounding domain (i) listed in the review protocol; and (ii) relevant to the setting of this particular study, or which the study authors identified as potentially important.

"Important" confounding domains are those for which, in the context of this study, adjustment is expected to lead to a clinically important change in the estimated effect of the intervention. "Validity" refers to whether the confounding variable or variables fully measure the domain, while "reliability" refers to the precision of the measurement (more measurement error means less reliability).

(i) Confounding domains listed in the review protocol				
Confounding domain	Measured variable(s)	Is there evidence that controlling for this variable was unnecessary?*	Is the confounding domain measured validly and reliably by this variable (or these variables)?	OPTIONAL: Is failure to adjust for this variable (alone) expected to favour the experimental intervention or the comparator?
			Yes / No / No information	Favour experimental / Favour comparator / No information
Artrose/Degeneration	Tönnis grade	No	Yes	Favour comparator
BMI	Weight	No	Yes	No information
Congruency	Sphericity index (Severin)	No	Yes	No Information
Comobidity	Restrictive ambulation	No	No	No information

(ii) Additional confounding domains relevant to the setting of this particular study, or which the study authors identified as important				
Confounding domain	Measured variable(s)	Is there evidence that controlling for this variable was unnecessary?*	Is the confounding domain measured validly and reliably by this variable (or these variables)?	OPTIONAL: Is failure to adjust for this variable (alone) expected to favour the experimental intervention or the comparator?
			Yes / No / No information	Favour experimental / Favour comparator / No information

* In the context of a particular study, variables can be demonstrated not to be confounders and so not included in the analysis: (a) if they are not predictive of the outcome; (b) if they are not predictive of intervention; or (c) because adjustment makes no or minimal difference to the estimated effect of the primary parameter. Note that “no statistically significant association” is not the same as “not predictive”.

Preliminary consideration of co-interventions

Complete a row for each important co-intervention (i) listed in the review protocol; and (ii) relevant to the setting of this particular study, or which the study authors identified as important.

"Important" co-interventions are those for which, in the context of this study, adjustment is expected to lead to a clinically important change in the estimated effect of the intervention.

(i) Co-interventions listed in the review protocol		
Co-intervention	Is there evidence that controlling for this co-intervention was unnecessary (e.g. because it was not administered)?	Is presence of this co-intervention likely to favour outcomes in the experimental intervention or the comparator
NA		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information

(ii) Additional co-interventions relevant to the setting of this particular study, or which the study authors identified as important		
Co-intervention	Is there evidence that controlling for this co-intervention was unnecessary (e.g. because it was not administered)?	Is presence of this co-intervention likely to favour outcomes in the experimental intervention or the comparator
NA		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information

Risk of bias assessment

Responses underlined in green are potential markers for low risk of bias, and responses in red are potential markers for a risk of bias. Where questions relate only to sign posts to other questions, no formatting is used.

Signalling questions	Description	Response options
Bias due to confounding		
1.1 Is there potential for confounding of the effect of intervention in this study? **If N/PN to 1.1:** the study can be considered to be at low risk of bias due to confounding and no further signalling questions need be considered	Y	Y / PY / PN / N
If Y/PY to 1.1: determine whether there is a need to assess time-varying confounding:		
1.2. Was the analysis based on splitting participants' follow up time according to intervention received? **If N/PN**, answer questions relating to baseline confounding (1.4 to 1.6) **If Y/PY**, go to question 1.3.	N	NA / Y / PY / PN / N / NI
1.3. Were intervention discontinuations or switches likely to be related to factors that are prognostic for the outcome? **If N/PN**, answer questions relating to baseline confounding (1.4 to 1.6) **If Y/PY**, answer questions relating to both baseline and time-varying confounding (1.7 and 1.8)		NA / Y / PY / PN / N / NI

Questions relating to baseline confounding only		
1.4. Did the authors use an appropriate analysis method that controlled for all the important confounding domains?	N	NA / Y / PY / PN / N / NI
1.5. **If Y/PY to 1.4**: Were confounding domains that were controlled for measured validly and reliably by the variables available in this study?		NA / Y / PY / PN / N / NI
1.6. Did the authors control for any post-intervention variables that could have been affected by the intervention?	N	NA / Y / PY / PN / N / NI
Questions relating to baseline and time-varying confounding		
1.7. Did the authors use an appropriate analysis method that controlled for all the important confounding domains and for time-varying confounding?	Y	NA / Y / PY / PN / N / NI
1.8. **If Y/PY to 1.7**: Were confounding domains that were controlled for measured validly and reliably by the variables available in this study?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Serious	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to confounding?	Unpredictable	Favours experimental / Favours comparator / Unpredictable

Bias in selection of participants into the study		
2.1. Was selection of participants into the study (or into the analysis) based on participant characteristics observed after the start of intervention? **If N/PN to 2.1:** go to 2.4	Y	Y / PY / PN / N / NI
2.2. **If Y/PY to 2.1**: Were the post-intervention variables that influenced selection likely to be associated with intervention?	Y	NA / Y / PY / PN / N / NI
2.3 **If Y/PY to 2.2**: Were the post-intervention variables that influenced selection likely to be influenced by the outcome or a cause of the outcome?	N	NA / Y / PY / PN / N / NI
2.4. Do start of follow-up and start of intervention coincide for most participants?	Y	Y / PY / PN / N / NI
2.5. **If Y/PY to 2.2 and 2.3, or N/PN to 2.4**: Were adjustment techniques used that are likely to correct for the presence of selection biases?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Serious	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to selection of participants into the study?	Favours experimental	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in classification of interventions		
3.1 Were intervention groups clearly defined?	Y	Y / PY / PN / N / NI
3.2 Was the information used to define intervention groups recorded at the start of the intervention?	N	Y / PY / PN / N / NI
3.3 Could classification of intervention status have been affected by knowledge of the outcome or risk of the outcome?	N	Y / PY / PN / N / NI
Risk of bias judgement	Moderate	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to classification of interventions?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias due to deviations from intended interventions		
If your aim for this study is to assess the effect of assignment to intervention, answer questions 4.1 and 4.2		
4.1. Were there deviations from the intended intervention beyond what would be expected in usual practice?	N	Y / PY / PN / N / NI
4.2. **If Y/PY to 4.1**: Were these deviations from intended intervention unbalanced between groups *and* likely to have affected the outcome?		NA / Y / PY / PN / N / NI
If your aim for this study is to assess the effect of starting and adhering to intervention, answer questions 4.3 to 4.6		
4.3. Were important co-interventions balanced across intervention groups?	NI	Y / PY / PN / N / NI
4.4. Was the intervention implemented successfully for most participants?	Y	Y / PY / PN / N / NI
4.5. Did study participants adhere to the assigned intervention regimen?	Y	Y / PY / PN / N / NI
4.6. **If N/PN to 4.3, 4.4 or 4.5**: Was an appropriate analysis used to estimate the effect of starting and adhering to the intervention?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to deviations from the intended interventions?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias due to missing data		
5.1 Were outcome data available for all, or nearly all, participants?	Y	Y / PY / PN / N / NI
5.2 Were participants excluded due to missing data on intervention status?	Y	Y / PY / PN / N / NI
5.3 Were participants excluded due to missing data on other variables needed for the analysis?	N	Y / PY / PN / N / NI
5.4 **If PN/N to 5.1, or Y/PY to 5.2 or 5.3**: Are the proportion of participants and reasons for missing data similar across interventions?		NA / Y / PY / PN / N / NI
5.5 **If PN/N to 5.1, or Y/PY to 5.2 or 5.3**: Is there evidence that results were robust to the presence of missing data?	N	NA / Y / PY / PN / N / NI
Risk of bias judgement	Moderate	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to missing data?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in measurement of outcomes		
6.1 Could the outcome measure have been influenced by knowledge of the intervention received?	N	Y / PY / PN / N / NI
6.2 Were outcome assessors aware of the intervention received by study participants?	Y	Y / PY / PN / N / NI
6.3 Were the methods of outcome assessment comparable across intervention groups?	Y	Y / PY / PN / N / NI
6.4 Were any systematic errors in measurement of the outcome related to intervention received?	N	Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to measurement of outcomes?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in selection of the reported result		
Is the reported effect estimate likely to be selected, on the basis of the results, from... 7.1. ... multiple outcome *measurements* within the outcome domain?	Y	Y / PY / PN / N / NI
7.2 ... multiple *analyses* of the intervention-outcome relationship?	N	Y / PY / PN / N / NI
7.3 ... different *subgroups*?	N	Y / PY / PN / N / NI
Risk of bias judgement	Moderate	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to selection of the reported result?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Overall bias		
Risk of bias judgement	Critical	Low / Moderate / Serious / Critical / NI
Optional: What is the overall predicted direction of bias for this outcome?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

The Risk Of Bias In Non-randomized Studies – of Interventions (ROBINS-I) assessment tool

(version for cohort-type studies)

Version 19 September 2016

ROBINS-I tool (Stage I): At protocol stage

Specify the review question

Participants	Ole Ovesen, Stig Storgaard Jakobsen
Experimental intervention	Periacatabular osteotomi over 50 år.
Comparator	Operation med periacetabular osteotomi under 50 år.
Outcomes	1. Patient Related Outcome Score (*eg.* WOMAC; HOOS, OHS, HHS, FJS, SF-36, EQ-5D) 2. Konversion til THA 3. Komplikation (Stor –The Clavien-Dindo Classification of Surgical Complications grade III/IV) samt iatrogen nervelæsion, iatrogen karlæsion)

List the confounding domains relevant to all or most studies

Artrose/degeneration, BMI, Kongruens, Komorbiditet,

List co-interventions that could be different between intervention groups and that could impact on outcomes

Ingen

ROBINS-I tool (Stage II): For each study

Specify a target randomized trial specific to the study

Design	Individually randomized / Cluster randomized / Matched (e.g. cross-over)
Participants	Willey et al. 2022, Risk Factors for Composite Failure of Hip Dysplasia Treated With Periacetabular Osteotomy: A Minimum 10-Year Follow-up
Experimental intervention	
Comparator	

Is your aim for this study…?

☐ to assess the effect of *assignment to* intervention

☐ to assess the effect of *starting and adhering to* intervention

Specify the outcome

Specify which outcome is being assessed for risk of bias (typically from among those earmarked for the Summary of Findings table). Specify whether this is a proposed benefit or harm of intervention.

Specify the numerical result being assessed

In case of multiple alternative analyses being presented, specify the numeric result (e.g. RR = 1.52 (95% CI 0.83 to 2.77) and/or a reference (e.g. to a table, figure or paragraph) that uniquely defines the result being assessed.

Preliminary consideration of confounders

Complete a row for each important confounding domain (i) listed in the review protocol; and (ii) relevant to the setting of this particular study, or which the study authors identified as potentially important.

"Important" confounding domains are those for which, in the context of this study, adjustment is expected to lead to a clinically important change in the estimated effect of the intervention. "Validity" refers to whether the confounding variable or variables fully measure the domain, while "reliability" refers to the precision of the measurement (more measurement error means less reliability).

(i) Confounding domains listed in the review protocol				
Confounding domain	Measured variable(s)	Is there evidence that controlling for this variable was unnecessary?*	Is the confounding domain measured validly and reliably by this variable (or these variables)?	OPTIONAL: Is failure to adjust for this variable (alone) expected to favour the experimental intervention or the comparator?
			Yes / No / No information	Favour experimental / Favour comparator / No information
Artrose/Degeneration	Tönnis grade	No	Yes	Favour comparator
BMI	Weight	No	Yes	No information
Congruency	Sphericity index (Severin)	No	Yes	No Information
Comobidity	Restrictive ambulation	No	No	No information

(ii) Additional confounding domains relevant to the setting of this particular study, or which the study authors identified as important				
Confounding domain	Measured variable(s)	Is there evidence that controlling for this variable was unnecessary?*	Is the confounding domain measured validly and reliably by this variable (or these variables)?	OPTIONAL: Is failure to adjust for this variable (alone) expected to favour the experimental intervention or the comparator?
			Yes / No / No information	Favour experimental / Favour comparator / No information

* In the context of a particular study, variables can be demonstrated not to be confounders and so not included in the analysis: (a) if they are not predictive of the outcome; (b) if they are not predictive of intervention; or (c) because adjustment makes no or minimal difference to the estimated effect of the primary parameter. Note that “no statistically significant association” is not the same as “not predictive”.

Preliminary consideration of co-interventions

Complete a row for each important co-intervention (i) listed in the review protocol; and (ii) relevant to the setting of this particular study, or which the study authors identified as important.

"Important" co-interventions are those for which, in the context of this study, adjustment is expected to lead to a clinically important change in the estimated effect of the intervention.

(i) Co-interventions listed in the review protocol		
Co-intervention	Is there evidence that controlling for this co-intervention was unnecessary (e.g. because it was not administered)?	Is presence of this co-intervention likely to favour outcomes in the experimental intervention or the comparator
NA		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information

(ii) Additional co-interventions relevant to the setting of this particular study, or which the study authors identified as important		
Co-intervention	Is there evidence that controlling for this co-intervention was unnecessary (e.g. because it was not administered)?	Is presence of this co-intervention likely to favour outcomes in the experimental intervention or the comparator
NA		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information

Risk of bias assessment

Responses underlined in green are potential markers for low risk of bias, and responses in red are potential markers for a risk of bias. Where questions relate only to sign posts to other questions, no formatting is used.

Signalling questions	Description	Response options
Bias due to confounding		
1.1 Is there potential for confounding of the effect of intervention in this study? **If N/PN to 1.1:** the study can be considered to be at low risk of bias due to confounding and no further signalling questions need be considered	Y	Y / PY / PN / N
If Y/PY to 1.1: determine whether there is a need to assess time-varying confounding:		
1.2. Was the analysis based on splitting participants' follow up time according to intervention received? **If N/PN**, answer questions relating to baseline confounding (1.4 to 1.6) **If Y/PY**, go to question 1.3.	N	NA / Y / PY / PN / N / NI
1.3. Were intervention discontinuations or switches likely to be related to factors that are prognostic for the outcome? **If N/PN**, answer questions relating to baseline confounding (1.4 to 1.6) **If Y/PY**, answer questions relating to both baseline and time-varying confounding (1.7 and 1.8)		NA / Y / PY / PN / N / NI

Questions relating to baseline confounding only		
1.4. Did the authors use an appropriate analysis method that controlled for all the important confounding domains?	Y	NA / Y / PY / PN / N / NI
1.5. **If Y/PY to 1.4**: Were confounding domains that were controlled for measured validly and reliably by the variables available in this study?		NA / Y / PY / PN / N / NI
1.6. Did the authors control for any post-intervention variables that could have been affected by the intervention?	N	NA / Y / PY / PN / N / NI
Questions relating to baseline and time-varying confounding		
1.7. Did the authors use an appropriate analysis method that controlled for all the important confounding domains and for time-varying confounding?	Y	NA / Y / PY / PN / N / NI
1.8. **If Y/PY to 1.7**: Were confounding domains that were controlled for measured validly and reliably by the variables available in this study?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to confounding?	Unpredictable	Favours experimental / Favours comparator / Unpredictable

Bias in selection of participants into the study		
2.1. Was selection of participants into the study (or into the analysis) based on participant characteristics observed after the start of intervention? **If N/PN to 2.1:** go to 2.4	N	Y / PY / PN / N / NI
2.2. **If Y/PY to 2.1**: Were the post-intervention variables that influenced selection likely to be associated with intervention?		NA / Y / PY / PN / N / NI
2.3 **If Y/PY to 2.2**: Were the post-intervention variables that influenced selection likely to be influenced by the outcome or a cause of the outcome?		NA / Y / PY / PN / N / NI
2.4. Do start of follow-up and start of intervention coincide for most participants?	Y	Y / PY / PN / N / NI
2.5. **If Y/PY to 2.2 and 2.3, or N/PN to 2.4**: Were adjustment techniques used that are likely to correct for the presence of selection biases?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to selection of participants into the study?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in classification of interventions		
3.1 Were intervention groups clearly defined?	Y	Y / PY / PN / N / NI
3.2 Was the information used to define intervention groups recorded at the start of the intervention?	Y	Y / PY / PN / N / NI
3.3 Could classification of intervention status have been affected by knowledge of the outcome or risk of the outcome?	N	Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to classification of interventions?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias due to deviations from intended interventions		
If your aim for this study is to assess the effect of assignment to intervention, answer questions 4.1 and 4.2		
4.1. Were there deviations from the intended intervention beyond what would be expected in usual practice?	N	Y / PY / PN / N / NI
4.2. **If Y/PY to 4.1**: Were these deviations from intended intervention unbalanced between groups *and* likely to have affected the outcome?		NA / Y / PY / PN / N / NI
If your aim for this study is to assess the effect of starting and adhering to intervention, answer questions 4.3 to 4.6		
4.3. Were important co-interventions balanced across intervention groups?	NI	Y / PY / PN / N / NI
4.4. Was the intervention implemented successfully for most participants?	Y	Y / PY / PN / N / NI
4.5. Did study participants adhere to the assigned intervention regimen?	Y	Y / PY / PN / N / NI
4.6. **If N/PN to 4.3, 4.4 or 4.5**: Was an appropriate analysis used to estimate the effect of starting and adhering to the intervention?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to deviations from the intended interventions?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias due to missing data		
5.1 Were outcome data available for all, or nearly all, participants?	Y	Y / PY / PN / N / NI
5.2 Were participants excluded due to missing data on intervention status?	Y	Y / PY / PN / N / NI
5.3 Were participants excluded due to missing data on other variables needed for the analysis?	N	Y / PY / PN / N / NI
5.4 **If PN/N to 5.1, or Y/PY to 5.2 or 5.3**: Are the proportion of participants and reasons for missing data similar across interventions?		NA / Y / PY / PN / N / NI
5.5 **If PN/N to 5.1, or Y/PY to 5.2 or 5.3**: Is there evidence that results were robust to the presence of missing data?	N	NA / Y / PY / PN / N / NI
Risk of bias judgement	Moderate	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to missing data?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in measurement of outcomes		
6.1 Could the outcome measure have been influenced by knowledge of the intervention received?	N	Y / PY / PN / N / NI
6.2 Were outcome assessors aware of the intervention received by study participants?	Y	Y / PY / PN / N / NI
6.3 Were the methods of outcome assessment comparable across intervention groups?	Y	Y / PY / PN / N / NI
6.4 Were any systematic errors in measurement of the outcome related to intervention received?	N	Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to measurement of outcomes?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in selection of the reported result		
Is the reported effect estimate likely to be selected, on the basis of the results, from... 7.1. ... multiple outcome *measurements* within the outcome domain?	N	Y / PY / PN / N / NI
7.2 ... multiple *analyses* of the intervention-outcome relationship?	N	Y / PY / PN / N / NI
7.3 ... different *subgroups*?	N	Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to selection of the reported result?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Overall bias		
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the overall predicted direction of bias for this outcome?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

The Risk Of Bias In Non-randomized Studies – of Interventions (ROBINS-I) assessment tool

(version for cohort-type studies)

Version 19 September 2016

ROBINS-I tool (Stage I): At protocol stage

Specify the review question

Participants	Ole Ovesen, Stig Storgaard Jakobsen
Experimental intervention	Periacatabular osteotomi over 50 år.
Comparator	Operation med periacetabular osteotomi under 50 år.
Outcomes	1. Patient Related Outcome Score (*eg.* WOMAC; HOOS, OHS, HHS, FJS, SF-36, EQ-5D) 2. Konversion til THA 3. Komplikation (Stor –The Clavien-Dindo Classification of Surgical Complications grade III/IV) samt iatrogen nervelæsion, iatrogen karlæsion)

List the confounding domains relevant to all or most studies

Artrose/degeneration, BMI, Kongruens, Komorbiditet,

List co-interventions that could be different between intervention groups and that could impact on outcomes

Ingen

ROBINS-I tool (Stage II): For each study

Specify a target randomized trial specific to the study

Design	Individually randomized / Cluster randomized / Matched (e.g. cross-over)
Participants	Salih et al. 2020, Hypermobility, age 40 years or older and BMI >30 kg m2 increase the risk of complications following peri-acetabular osteotomy
Experimental intervention	
Comparator	

Is your aim for this study…?

☐ to assess the effect of *assignment to* intervention

☐ to assess the effect of *starting and adhering to* intervention

Specify the outcome

Specify which outcome is being assessed for risk of bias (typically from among those earmarked for the Summary of Findings table). Specify whether this is a proposed benefit or harm of intervention.

Specify the numerical result being assessed

In case of multiple alternative analyses being presented, specify the numeric result (e.g. RR = 1.52 (95% CI 0.83 to 2.77) and/or a reference (e.g. to a table, figure or paragraph) that uniquely defines the result being assessed.

Preliminary consideration of confounders

Complete a row for each important confounding domain (i) listed in the review protocol; and (ii) relevant to the setting of this particular study, or which the study authors identified as potentially important.

"Important" confounding domains are those for which, in the context of this study, adjustment is expected to lead to a clinically important change in the estimated effect of the intervention. "Validity" refers to whether the confounding variable or variables fully measure the domain, while "reliability" refers to the precision of the measurement (more measurement error means less reliability).

(i) Confounding domains listed in the review protocol				
Confounding domain	Measured variable(s)	Is there evidence that controlling for this variable was unnecessary?*	Is the confounding domain measured validly and reliably by this variable (or these variables)?	OPTIONAL: Is failure to adjust for this variable (alone) expected to favour the experimental intervention or the comparator?
			Yes / No / No information	Favour experimental / Favour comparator / No information
Artrose/Degeneration	Tönnis grade	No	Yes	Favour comparator
BMI	Weight	No	Yes	No information
Congruency	Sphericity index (Severin)	No	Yes	No Information
Comobidity	Restrictive ambulation	No	No	No information

(ii) Additional confounding domains relevant to the setting of this particular study, or which the study authors identified as important				
Confounding domain	Measured variable(s)	Is there evidence that controlling for this variable was unnecessary?*	Is the confounding domain measured validly and reliably by this variable (or these variables)?	OPTIONAL: Is failure to adjust for this variable (alone) expected to favour the experimental intervention or the comparator?
			Yes / No / No information	Favour experimental / Favour comparator / No information

* In the context of a particular study, variables can be demonstrated not to be confounders and so not included in the analysis: (a) if they are not predictive of the outcome; (b) if they are not predictive of intervention; or (c) because adjustment makes no or minimal difference to the estimated effect of the primary parameter. Note that “no statistically significant association” is not the same as “not predictive”.

Preliminary consideration of co-interventions

Complete a row for each important co-intervention (i) listed in the review protocol; and (ii) relevant to the setting of this particular study, or which the study authors identified as important.

"Important" co-interventions are those for which, in the context of this study, adjustment is expected to lead to a clinically important change in the estimated effect of the intervention.

(i) Co-interventions listed in the review protocol		
Co-intervention	Is there evidence that controlling for this co-intervention was unnecessary (e.g. because it was not administered)?	Is presence of this co-intervention likely to favour outcomes in the experimental intervention or the comparator
NA		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information

(ii) Additional co-interventions relevant to the setting of this particular study, or which the study authors identified as important		
Co-intervention	Is there evidence that controlling for this co-intervention was unnecessary (e.g. because it was not administered)?	Is presence of this co-intervention likely to favour outcomes in the experimental intervention or the comparator
NA		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information

Risk of bias assessment

Responses underlined in green are potential markers for low risk of bias, and responses in red are potential markers for a risk of bias. Where questions relate only to sign posts to other questions, no formatting is used.

Signalling questions	Description	Response options
Bias due to confounding		
1.1 Is there potential for confounding of the effect of intervention in this study? **If N/PN to 1.1:** the study can be considered to be at low risk of bias due to confounding and no further signalling questions need be considered	Y	Y / PY / PN / N
If Y/PY to 1.1: determine whether there is a need to assess time-varying confounding:		
1.2. Was the analysis based on splitting participants' follow up time according to intervention received? **If N/PN**, answer questions relating to baseline confounding (1.4 to 1.6) **If Y/PY**, go to question 1.3.	N	NA / Y / PY / PN / N / NI
1.3. Were intervention discontinuations or switches likely to be related to factors that are prognostic for the outcome? **If N/PN**, answer questions relating to baseline confounding (1.4 to 1.6) **If Y/PY**, answer questions relating to both baseline and time-varying confounding (1.7 and 1.8)		NA / Y / PY / PN / N / NI

Questions relating to baseline confounding only		
1.4. Did the authors use an appropriate analysis method that controlled for all the important confounding domains?	N	NA / Y / PY / PN / N / NI
1.5. **If Y/PY to 1.4**: Were confounding domains that were controlled for measured validly and reliably by the variables available in this study?		NA / Y / PY / PN / N / NI
1.6. Did the authors control for any post-intervention variables that could have been affected by the intervention?	N	NA / Y / PY / PN / N / NI
Questions relating to baseline and time-varying confounding		
1.7. Did the authors use an appropriate analysis method that controlled for all the important confounding domains and for time-varying confounding?	Y	NA / Y / PY / PN / N / NI
1.8. **If Y/PY to 1.7**: Were confounding domains that were controlled for measured validly and reliably by the variables available in this study?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Moderate	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to confounding?	Unpredictable	Favours experimental / Favours comparator / Unpredictable

Bias in selection of participants into the study		
2.1. Was selection of participants into the study (or into the analysis) based on participant characteristics observed after the start of intervention? **If N/PN to 2.1:** go to 2.4	N	Y / PY / PN / N / NI
2.2. **If Y/PY to 2.1**: Were the post-intervention variables that influenced selection likely to be associated with intervention?		NA / Y / PY / PN / N / NI
2.3 **If Y/PY to 2.2**: Were the post-intervention variables that influenced selection likely to be influenced by the outcome or a cause of the outcome?		NA / Y / PY / PN / N / NI
2.4. Do start of follow-up and start of intervention coincide for most participants?	Y	Y / PY / PN / N / NI
2.5. **If Y/PY to 2.2 and 2.3, or N/PN to 2.4**: Were adjustment techniques used that are likely to correct for the presence of selection biases?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to selection of participants into the study?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in classification of interventions		
3.1 Were intervention groups clearly defined?	Y	Y / PY / PN / N / NI
3.2 Was the information used to define intervention groups recorded at the start of the intervention?	Y	Y / PY / PN / N / NI
3.3 Could classification of intervention status have been affected by knowledge of the outcome or risk of the outcome?	N	Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to classification of interventions?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias due to deviations from intended interventions		
If your aim for this study is to assess the effect of assignment to intervention, answer questions 4.1 and 4.2		
4.1. Were there deviations from the intended intervention beyond what would be expected in usual practice?	N	Y / PY / PN / N / NI
4.2. **If Y/PY to 4.1**: Were these deviations from intended intervention unbalanced between groups *and* likely to have affected the outcome?		NA / Y / PY / PN / N / NI
If your aim for this study is to assess the effect of starting and adhering to intervention, answer questions 4.3 to 4.6		
4.3. Were important co-interventions balanced across intervention groups?	NI	Y / PY / PN / N / NI
4.4. Was the intervention implemented successfully for most participants?	Y	Y / PY / PN / N / NI
4.5. Did study participants adhere to the assigned intervention regimen?	Y	Y / PY / PN / N / NI
4.6. **If N/PN to 4.3, 4.4 or 4.5**: Was an appropriate analysis used to estimate the effect of starting and adhering to the intervention?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to deviations from the intended interventions?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias due to missing data		
5.1 Were outcome data available for all, or nearly all, participants?	Y	Y / PY / PN / N / NI
5.2 Were participants excluded due to missing data on intervention status?	Y	Y / PY / PN / N / NI
5.3 Were participants excluded due to missing data on other variables needed for the analysis?	N	Y / PY / PN / N / NI
5.4 **If PN/N to 5.1, or Y/PY to 5.2 or 5.3**: Are the proportion of participants and reasons for missing data similar across interventions?		NA / Y / PY / PN / N / NI
5.5 **If PN/N to 5.1, or Y/PY to 5.2 or 5.3**: Is there evidence that results were robust to the presence of missing data?	N	NA / Y / PY / PN / N / NI
Risk of bias judgement	Moderate	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to missing data?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in measurement of outcomes		
6.1 Could the outcome measure have been influenced by knowledge of the intervention received?	N	Y / PY / PN / N / NI
6.2 Were outcome assessors aware of the intervention received by study participants?	Y	Y / PY / PN / N / NI
6.3 Were the methods of outcome assessment comparable across intervention groups?	Y	Y / PY / PN / N / NI
6.4 Were any systematic errors in measurement of the outcome related to intervention received?	N	Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to measurement of outcomes?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in selection of the reported result		
Is the reported effect estimate likely to be selected, on the basis of the results, from... 7.1. ... multiple outcome *measurements* within the outcome domain?	N	Y / PY / PN / N / NI
7.2 ... multiple *analyses* of the intervention-outcome relationship?	N	Y / PY / PN / N / NI
7.3 ... different *subgroups*?	N	Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to selection of the reported result?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Overall bias		
Risk of bias judgement	Low - Moderate	Low / Moderate / Serious / Critical / NI
Optional: What is the overall predicted direction of bias for this outcome?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

The Risk Of Bias In Non-randomized Studies – of Interventions (ROBINS-I) assessment tool

(version for cohort-type studies)

Version 19 September 2016

ROBINS-I tool (Stage I): At protocol stage

Specify the review question

Participants	Ole Ovesen, Stig Storgaard Jakobsen
Experimental intervention	Periacatabular osteotomi over 50 år.
Comparator	Operation med periacetabular osteotomi under 50 år.
Outcomes	1. Patient Related Outcome Score (*eg.* WOMAC; HOOS, OHS, HHS, FJS, SF-36, EQ-5D) 2. Konversion til THA 3. Komplikation (Stor –The Clavien-Dindo Classification of Surgical Complications grade III/IV) samt iatrogen nervelæsion, iatrogen karlæsion)

List the confounding domains relevant to all or most studies

Artrose/degeneration, BMI, Kongruens, Komorbiditet,

List co-interventions that could be different between intervention groups and that could impact on outcomes

Ingen

ROBINS-I tool (Stage II): For each study

Specify a target randomized trial specific to the study

Design	Individually randomized / Cluster randomized / Matched (e.g. cross-over)
Participants	Larsen et al. 2020, 14-year hip survivorship after periacetabular osteotomy: a follow-up study on 1,385 hips
Experimental intervention	
Comparator	

Is your aim for this study…?

☐ to assess the effect of *assignment to* intervention

☐ to assess the effect of *starting and adhering to* intervention

Specify the outcome

Specify which outcome is being assessed for risk of bias (typically from among those earmarked for the Summary of Findings table). Specify whether this is a proposed benefit or harm of intervention.

Specify the numerical result being assessed

In case of multiple alternative analyses being presented, specify the numeric result (e.g. RR = 1.52 (95% CI 0.83 to 2.77) and/or a reference (e.g. to a table, figure or paragraph) that uniquely defines the result being assessed.

Preliminary consideration of confounders

Complete a row for each important confounding domain (i) listed in the review protocol; and (ii) relevant to the setting of this particular study, or which the study authors identified as potentially important.

"Important" confounding domains are those for which, in the context of this study, adjustment is expected to lead to a clinically important change in the estimated effect of the intervention. "Validity" refers to whether the confounding variable or variables fully measure the domain, while "reliability" refers to the precision of the measurement (more measurement error means less reliability).

(i) Confounding domains listed in the review protocol				
Confounding domain	Measured variable(s)	Is there evidence that controlling for this variable was unnecessary?*	Is the confounding domain measured validly and reliably by this variable (or these variables)?	OPTIONAL: Is failure to adjust for this variable (alone) expected to favour the experimental intervention or the comparator?
			Yes / No / No information	Favour experimental / Favour comparator / No information
Artrose/Degeneration	Tönnis grade	No	Yes	Favour comparator
BMI	Weight	No	Yes	No information
Congruency	Sphericity index (Severin)	No	Yes	No Information
Comobidity	Restrictive ambulation	No	No	No information

(ii) Additional confounding domains relevant to the setting of this particular study, or which the study authors identified as important				
Confounding domain	Measured variable(s)	Is there evidence that controlling for this variable was unnecessary?*	Is the confounding domain measured validly and reliably by this variable (or these variables)?	OPTIONAL: Is failure to adjust for this variable (alone) expected to favour the experimental intervention or the comparator?
			Yes / No / No information	Favour experimental / Favour comparator / No information

* In the context of a particular study, variables can be demonstrated not to be confounders and so not included in the analysis: (a) if they are not predictive of the outcome; (b) if they are not predictive of intervention; or (c) because adjustment makes no or minimal difference to the estimated effect of the primary parameter. Note that “no statistically significant association” is not the same as “not predictive”.

Preliminary consideration of co-interventions

Complete a row for each important co-intervention (i) listed in the review protocol; and (ii) relevant to the setting of this particular study, or which the study authors identified as important.

"Important" co-interventions are those for which, in the context of this study, adjustment is expected to lead to a clinically important change in the estimated effect of the intervention.

(i) Co-interventions listed in the review protocol		
Co-intervention	Is there evidence that controlling for this co-intervention was unnecessary (e.g. because it was not administered)?	Is presence of this co-intervention likely to favour outcomes in the experimental intervention or the comparator
NA		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information

(ii) Additional co-interventions relevant to the setting of this particular study, or which the study authors identified as important		
Co-intervention	Is there evidence that controlling for this co-intervention was unnecessary (e.g. because it was not administered)?	Is presence of this co-intervention likely to favour outcomes in the experimental intervention or the comparator
NA		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information

Risk of bias assessment

Responses underlined in green are potential markers for low risk of bias, and responses in red are potential markers for a risk of bias. Where questions relate only to sign posts to other questions, no formatting is used.

Signalling questions	Description	Response options
Bias due to confounding		
1.1 Is there potential for confounding of the effect of intervention in this study? **If N/PN to 1.1:** the study can be considered to be at low risk of bias due to confounding and no further signalling questions need be considered	Y	Y / PY / PN / N
If Y/PY to 1.1: determine whether there is a need to assess time-varying confounding:		
1.2. Was the analysis based on splitting participants' follow up time according to intervention received? **If N/PN**, answer questions relating to baseline confounding (1.4 to 1.6) **If Y/PY**, go to question 1.3.	N	NA / Y / PY / PN / N / NI
1.3. Were intervention discontinuations or switches likely to be related to factors that are prognostic for the outcome? **If N/PN**, answer questions relating to baseline confounding (1.4 to 1.6) **If Y/PY**, answer questions relating to both baseline and time-varying confounding (1.7 and 1.8)		NA / Y / PY / PN / N / NI

Questions relating to baseline confounding only		
1.4. Did the authors use an appropriate analysis method that controlled for all the important confounding domains?	N	NA / Y / PY / PN / N / NI
1.5. **If Y/PY to 1.4**: Were confounding domains that were controlled for measured validly and reliably by the variables available in this study?		NA / Y / PY / PN / N / NI
1.6. Did the authors control for any post-intervention variables that could have been affected by the intervention?	Y	NA / Y / PY / PN / N / NI
Questions relating to baseline and time-varying confounding		
1.7. Did the authors use an appropriate analysis method that controlled for all the important confounding domains and for time-varying confounding?	N	NA / Y / PY / PN / N / NI
1.8. **If Y/PY to 1.7**: Were confounding domains that were controlled for measured validly and reliably by the variables available in this study?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Moderate	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to confounding?	Unpredictable	Favours experimental / Favours comparator / Unpredictable

Bias in selection of participants into the study		
2.1. Was selection of participants into the study (or into the analysis) based on participant characteristics observed after the start of intervention? **If N/PN to 2.1:** go to 2.4	N	Y / PY / PN / N / NI
2.2. **If Y/PY to 2.1**: Were the post-intervention variables that influenced selection likely to be associated with intervention?		NA / Y / PY / PN / N / NI
2.3 **If Y/PY to 2.2**: Were the post-intervention variables that influenced selection likely to be influenced by the outcome or a cause of the outcome?		NA / Y / PY / PN / N / NI
2.4. Do start of follow-up and start of intervention coincide for most participants?	Y	Y / PY / PN / N / NI
2.5. **If Y/PY to 2.2 and 2.3, or N/PN to 2.4**: Were adjustment techniques used that are likely to correct for the presence of selection biases?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to selection of participants into the study?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in classification of interventions		
3.1 Were intervention groups clearly defined?	Y	Y / PY / PN / N / NI
3.2 Was the information used to define intervention groups recorded at the start of the intervention?	Y	Y / PY / PN / N / NI
3.3 Could classification of intervention status have been affected by knowledge of the outcome or risk of the outcome?	N	Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to classification of interventions?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias due to deviations from intended interventions		
If your aim for this study is to assess the effect of assignment to intervention, answer questions 4.1 and 4.2		
4.1. Were there deviations from the intended intervention beyond what would be expected in usual practice?	N	Y / PY / PN / N / NI
4.2. **If Y/PY to 4.1**: Were these deviations from intended intervention unbalanced between groups *and* likely to have affected the outcome?		NA / Y / PY / PN / N / NI
If your aim for this study is to assess the effect of starting and adhering to intervention, answer questions 4.3 to 4.6		
4.3. Were important co-interventions balanced across intervention groups?	NI	Y / PY / PN / N / NI
4.4. Was the intervention implemented successfully for most participants?	Y	Y / PY / PN / N / NI
4.5. Did study participants adhere to the assigned intervention regimen?	Y	Y / PY / PN / N / NI
4.6. **If N/PN to 4.3, 4.4 or 4.5**: Was an appropriate analysis used to estimate the effect of starting and adhering to the intervention?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to deviations from the intended interventions?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias due to missing data		
5.1 Were outcome data available for all, or nearly all, participants?	Y	Y / PY / PN / N / NI
5.2 Were participants excluded due to missing data on intervention status?	N	Y / PY / PN / N / NI
5.3 Were participants excluded due to missing data on other variables needed for the analysis?	Y	Y / PY / PN / N / NI
5.4 **If PN/N to 5.1, or Y/PY to 5.2 or 5.3**: Are the proportion of participants and reasons for missing data similar across interventions?		NA / Y / PY / PN / N / NI
5.5 **If PN/N to 5.1, or Y/PY to 5.2 or 5.3**: Is there evidence that results were robust to the presence of missing data?	N	NA / Y / PY / PN / N / NI
Risk of bias judgement	Moderate	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to missing data?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in measurement of outcomes		
6.1 Could the outcome measure have been influenced by knowledge of the intervention received?	N	Y / PY / PN / N / NI
6.2 Were outcome assessors aware of the intervention received by study participants?	Y	Y / PY / PN / N / NI
6.3 Were the methods of outcome assessment comparable across intervention groups?	Y	Y / PY / PN / N / NI
6.4 Were any systematic errors in measurement of the outcome related to intervention received?	N	Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to measurement of outcomes?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in selection of the reported result		
Is the reported effect estimate likely to be selected, on the basis of the results, from... 7.1. ... multiple outcome *measurements* within the outcome domain?	N	Y / PY / PN / N / NI
7.2 ... multiple *analyses* of the intervention-outcome relationship?	N	Y / PY / PN / N / NI
7.3 ... different *subgroups*?	N	Y / PY / PN / N / NI
Risk of bias judgement	LOW	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to selection of the reported result?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Overall bias		
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the overall predicted direction of bias for this outcome?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

The Risk Of Bias In Non-randomized Studies – of Interventions (ROBINS-I) assessment tool

(version for cohort-type studies)

Version 19 September 2016

ROBINS-I tool (Stage I): At protocol stage

Specify the review question

Participants	Ole Ovesen, Stig Storgaard Jakobsen
Experimental intervention	Periacatabular osteotomi over 50 år.
Comparator	Operation med periacetabular osteotomi under 50 år.
Outcomes	1. Patient Related Outcome Score (*eg.* WOMAC; HOOS, OHS, HHS, FJS, SF-36, EQ-5D) 2. Konversion til THA 3. Komplikation (Stor –The Clavien-Dindo Classification of Surgical Complications grade III/IV) samt iatrogen nervelæsion, iatrogen karlæsion)

List the confounding domains relevant to all or most studies

Artrose/degeneration, BMI, Kongruens, Komorbiditet,

List co-interventions that could be different between intervention groups and that could impact on outcomes

Ingen

ROBINS-I tool (Stage II): For each study

Specify a target randomized trial specific to the study

Design	Individually randomized / Cluster randomized / Matched (e.g. cross-over)
Participants	Muffly et al. 2021, Age at the Time of Surgery Is Not Predictive of Early Patient-Reported Outcomes After Periacetabular Osteotomy
Experimental intervention	
Comparator	

Is your aim for this study…?

☐ to assess the effect of *assignment to* intervention

☐ to assess the effect of *starting and adhering to* intervention

Specify the outcome

Specify which outcome is being assessed for risk of bias (typically from among those earmarked for the Summary of Findings table). Specify whether this is a proposed benefit or harm of intervention.

Specify the numerical result being assessed

In case of multiple alternative analyses being presented, specify the numeric result (e.g. RR = 1.52 (95% CI 0.83 to 2.77) and/or a reference (e.g. to a table, figure or paragraph) that uniquely defines the result being assessed.

Preliminary consideration of confounders

Complete a row for each important confounding domain (i) listed in the review protocol; and (ii) relevant to the setting of this particular study, or which the study authors identified as potentially important.

"Important" confounding domains are those for which, in the context of this study, adjustment is expected to lead to a clinically important change in the estimated effect of the intervention. "Validity" refers to whether the confounding variable or variables fully measure the domain, while "reliability" refers to the precision of the measurement (more measurement error means less reliability).

(i) Confounding domains listed in the review protocol				
Confounding domain	Measured variable(s)	Is there evidence that controlling for this variable was unnecessary?*	Is the confounding domain measured validly and reliably by this variable (or these variables)?	OPTIONAL: Is failure to adjust for this variable (alone) expected to favour the experimental intervention or the comparator?
			Yes / No / No information	Favour experimental / Favour comparator / No information
Artrose/Degeneration	Tönnis grade	No	Yes	Favour comparator
BMI	Weight	No	Yes	No information
Congruency	Sphericity index (Severin)	No	Yes	No Information
Comobidity	Restrictive ambulation	No	No	No information

(ii) Additional confounding domains relevant to the setting of this particular study, or which the study authors identified as important				
Confounding domain	Measured variable(s)	Is there evidence that controlling for this variable was unnecessary?*	Is the confounding domain measured validly and reliably by this variable (or these variables)?	OPTIONAL: Is failure to adjust for this variable (alone) expected to favour the experimental intervention or the comparator?
			Yes / No / No information	Favour experimental / Favour comparator / No information

* In the context of a particular study, variables can be demonstrated not to be confounders and so not included in the analysis: (a) if they are not predictive of the outcome; (b) if they are not predictive of intervention; or (c) because adjustment makes no or minimal difference to the estimated effect of the primary parameter. Note that “no statistically significant association” is not the same as “not predictive”.

Preliminary consideration of co-interventions

Complete a row for each important co-intervention (i) listed in the review protocol; and (ii) relevant to the setting of this particular study, or which the study authors identified as important.

"Important" co-interventions are those for which, in the context of this study, adjustment is expected to lead to a clinically important change in the estimated effect of the intervention.

(i) Co-interventions listed in the review protocol		
Co-intervention	Is there evidence that controlling for this co-intervention was unnecessary (e.g. because it was not administered)?	Is presence of this co-intervention likely to favour outcomes in the experimental intervention or the comparator
NA		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information

(ii) Additional co-interventions relevant to the setting of this particular study, or which the study authors identified as important		
Co-intervention	Is there evidence that controlling for this co-intervention was unnecessary (e.g. because it was not administered)?	Is presence of this co-intervention likely to favour outcomes in the experimental intervention or the comparator
NA		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information

Risk of bias assessment

Responses underlined in green are potential markers for low risk of bias, and responses in red are potential markers for a risk of bias. Where questions relate only to sign posts to other questions, no formatting is used.

Signalling questions	Description	Response options
Bias due to confounding		
1.1 Is there potential for confounding of the effect of intervention in this study? **If N/PN to 1.1:** the study can be considered to be at low risk of bias due to confounding and no further signalling questions need be considered	Y	Y / PY / PN / N
If Y/PY to 1.1: determine whether there is a need to assess time-varying confounding:		
1.2. Was the analysis based on splitting participants' follow up time according to intervention received? **If N/PN**, answer questions relating to baseline confounding (1.4 to 1.6) **If Y/PY**, go to question 1.3.	N	NA / Y / PY / PN / N / NI
1.3. Were intervention discontinuations or switches likely to be related to factors that are prognostic for the outcome? **If N/PN**, answer questions relating to baseline confounding (1.4 to 1.6) **If Y/PY**, answer questions relating to both baseline and time-varying confounding (1.7 and 1.8)		NA / Y / PY / PN / N / NI

Questions relating to baseline confounding only		
1.4. Did the authors use an appropriate analysis method that controlled for all the important confounding domains?	N	NA / Y / PY / PN / N / NI
1.5. **If Y/PY to 1.4**: Were confounding domains that were controlled for measured validly and reliably by the variables available in this study?		NA / Y / PY / PN / N / NI
1.6. Did the authors control for any post-intervention variables that could have been affected by the intervention?	Y	NA / Y / PY / PN / N / NI
Questions relating to baseline and time-varying confounding		
1.7. Did the authors use an appropriate analysis method that controlled for all the important confounding domains and for time-varying confounding?	N	NA / Y / PY / PN / N / NI
1.8. **If Y/PY to 1.7**: Were confounding domains that were controlled for measured validly and reliably by the variables available in this study?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Moderate	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to confounding?	Unpredictable	Favours experimental / Favours comparator / Unpredictable

Bias in selection of participants into the study		
2.1. Was selection of participants into the study (or into the analysis) based on participant characteristics observed after the start of intervention? **If N/PN to 2.1:** go to 2.4	N	Y / PY / PN / N / NI
2.2. **If Y/PY to 2.1**: Were the post-intervention variables that influenced selection likely to be associated with intervention?		NA / Y / PY / PN / N / NI
2.3 **If Y/PY to 2.2**: Were the post-intervention variables that influenced selection likely to be influenced by the outcome or a cause of the outcome?		NA / Y / PY / PN / N / NI
2.4. Do start of follow-up and start of intervention coincide for most participants?	Y	Y / PY / PN / N / NI
2.5. **If Y/PY to 2.2 and 2.3, or N/PN to 2.4**: Were adjustment techniques used that are likely to correct for the presence of selection biases?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to selection of participants into the study?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in classification of interventions		
3.1 Were intervention groups clearly defined?	Y	Y / PY / PN / N / NI
3.2 Was the information used to define intervention groups recorded at the start of the intervention?	Y	Y / PY / PN / N / NI
3.3 Could classification of intervention status have been affected by knowledge of the outcome or risk of the outcome?	N	Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to classification of interventions?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias due to deviations from intended interventions		
If your aim for this study is to assess the effect of assignment to intervention, answer questions 4.1 and 4.2		
4.1. Were there deviations from the intended intervention beyond what would be expected in usual practice?	N	Y / PY / PN / N / NI
4.2. **If Y/PY to 4.1**: Were these deviations from intended intervention unbalanced between groups *and* likely to have affected the outcome?		NA / Y / PY / PN / N / NI
If your aim for this study is to assess the effect of starting and adhering to intervention, answer questions 4.3 to 4.6		
4.3. Were important co-interventions balanced across intervention groups?	NI	Y / PY / PN / N / NI
4.4. Was the intervention implemented successfully for most participants?	Y	Y / PY / PN / N / NI
4.5. Did study participants adhere to the assigned intervention regimen?	Y	Y / PY / PN / N / NI
4.6. **If N/PN to 4.3, 4.4 or 4.5**: Was an appropriate analysis used to estimate the effect of starting and adhering to the intervention?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to deviations from the intended interventions?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias due to missing data		
5.1 Were outcome data available for all, or nearly all, participants?	Y	Y / PY / PN / N / NI
5.2 Were participants excluded due to missing data on intervention status?	N	Y / PY / PN / N / NI
5.3 Were participants excluded due to missing data on other variables needed for the analysis?	Y	Y / PY / PN / N / NI
5.4 **If PN/N to 5.1, or Y/PY to 5.2 or 5.3**: Are the proportion of participants and reasons for missing data similar across interventions?		NA / Y / PY / PN / N / NI
5.5 **If PN/N to 5.1, or Y/PY to 5.2 or 5.3**: Is there evidence that results were robust to the presence of missing data?	N	NA / Y / PY / PN / N / NI
Risk of bias judgement	Moderate	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to missing data?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in measurement of outcomes		
6.1 Could the outcome measure have been influenced by knowledge of the intervention received?	N	Y / PY / PN / N / NI
6.2 Were outcome assessors aware of the intervention received by study participants?	Y	Y / PY / PN / N / NI
6.3 Were the methods of outcome assessment comparable across intervention groups?	Y	Y / PY / PN / N / NI
6.4 Were any systematic errors in measurement of the outcome related to intervention received?	N	Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to measurement of outcomes?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in selection of the reported result		
Is the reported effect estimate likely to be selected, on the basis of the results, from... 7.1. ... multiple outcome *measurements* within the outcome domain?	N	Y / PY / PN / N / NI
7.2 ... multiple *analyses* of the intervention-outcome relationship?	N	Y / PY / PN / N / NI
7.3 ... different *subgroups*?	N	Y / PY / PN / N / NI
Risk of bias judgement	LOW	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to selection of the reported result?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Overall bias		
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the overall predicted direction of bias for this outcome?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

The Risk Of Bias In Non-randomized Studies – of Interventions (ROBINS-I) assessment tool

(version for cohort-type studies)

Version 19 September 2016

ROBINS-I tool (Stage I): At protocol stage

Specify the review question

Participants	Ole Ovesen, Stig Storgaard Jakobsen
Experimental intervention	Periacatabular osteotomi over 50 år.
Comparator	Operation med periacetabular osteotomi under 50 år.
Outcomes	1. Patient Related Outcome Score (*eg.* WOMAC; HOOS, OHS, HHS, FJS, SF-36, EQ-5D) 2. Konversion til THA 3. Komplikation (Stor –The Clavien-Dindo Classification of Surgical Complications grade III/IV) samt iatrogen nervelæsion, iatrogen karlæsion)

List the confounding domains relevant to all or most studies

Artrose/degeneration, BMI, Kongruens, Komorbiditet,

List co-interventions that could be different between intervention groups and that could impact on outcomes

Ingen

ROBINS-I tool (Stage II): For each study

Specify a target randomized trial specific to the study

Design	Individually randomized / Cluster randomized / Matched (e.g. cross-over)
Participants	Gu et al. 2021, Analysis of Factors Affecting Early Functional Recovery of Bernese Periacetabular Osteotomy
Experimental intervention	
Comparator	

Is your aim for this study…?

☐ to assess the effect of *assignment to* intervention

☐ to assess the effect of *starting and adhering to* intervention

Specify the outcome

Specify which outcome is being assessed for risk of bias (typically from among those earmarked for the Summary of Findings table). Specify whether this is a proposed benefit or harm of intervention.

Specify the numerical result being assessed

In case of multiple alternative analyses being presented, specify the numeric result (e.g. RR = 1.52 (95% CI 0.83 to 2.77) and/or a reference (e.g. to a table, figure or paragraph) that uniquely defines the result being assessed.

Preliminary consideration of confounders

Complete a row for each important confounding domain (i) listed in the review protocol; and (ii) relevant to the setting of this particular study, or which the study authors identified as potentially important.

"Important" confounding domains are those for which, in the context of this study, adjustment is expected to lead to a clinically important change in the estimated effect of the intervention. "Validity" refers to whether the confounding variable or variables fully measure the domain, while "reliability" refers to the precision of the measurement (more measurement error means less reliability).

(i) Confounding domains listed in the review protocol				
Confounding domain	Measured variable(s)	Is there evidence that controlling for this variable was unnecessary?*	Is the confounding domain measured validly and reliably by this variable (or these variables)?	OPTIONAL: Is failure to adjust for this variable (alone) expected to favour the experimental intervention or the comparator?
			Yes / No / No information	Favour experimental / Favour comparator / No information
Artrose/Degeneration	Tönnis grade	No	Yes	Favour comparator
BMI	Weight	No	Yes	No information
Congruency	Sphericity index (Severin)	No	Yes	No Information
Comobidity	Restrictive ambulation	No	No	No information

(ii) Additional confounding domains relevant to the setting of this particular study, or which the study authors identified as important				
Confounding domain	Measured variable(s)	Is there evidence that controlling for this variable was unnecessary?*	Is the confounding domain measured validly and reliably by this variable (or these variables)?	OPTIONAL: Is failure to adjust for this variable (alone) expected to favour the experimental intervention or the comparator?
			Yes / No / No information	Favour experimental / Favour comparator / No information

* In the context of a particular study, variables can be demonstrated not to be confounders and so not included in the analysis: (a) if they are not predictive of the outcome; (b) if they are not predictive of intervention; or (c) because adjustment makes no or minimal difference to the estimated effect of the primary parameter. Note that “no statistically significant association” is not the same as “not predictive”.

Preliminary consideration of co-interventions

Complete a row for each important co-intervention (i) listed in the review protocol; and (ii) relevant to the setting of this particular study, or which the study authors identified as important.

"Important" co-interventions are those for which, in the context of this study, adjustment is expected to lead to a clinically important change in the estimated effect of the intervention.

(i) Co-interventions listed in the review protocol		
Co-intervention	Is there evidence that controlling for this co-intervention was unnecessary (e.g. because it was not administered)?	Is presence of this co-intervention likely to favour outcomes in the experimental intervention or the comparator
NA		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information

(ii) Additional co-interventions relevant to the setting of this particular study, or which the study authors identified as important		
Co-intervention	Is there evidence that controlling for this co-intervention was unnecessary (e.g. because it was not administered)?	Is presence of this co-intervention likely to favour outcomes in the experimental intervention or the comparator
NA		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information

Risk of bias assessment

Responses underlined in green are potential markers for low risk of bias, and responses in red are potential markers for a risk of bias. Where questions relate only to sign posts to other questions, no formatting is used.

Signalling questions	Description	Response options
Bias due to confounding		
1.1 Is there potential for confounding of the effect of intervention in this study? **If N/PN to 1.1:** the study can be considered to be at low risk of bias due to confounding and no further signalling questions need be considered	Y	Y / PY / PN / N
If Y/PY to 1.1: determine whether there is a need to assess time-varying confounding:		
1.2. Was the analysis based on splitting participants' follow up time according to intervention received? **If N/PN**, answer questions relating to baseline confounding (1.4 to 1.6) **If Y/PY**, go to question 1.3.	N	NA / Y / PY / PN / N / NI
1.3. Were intervention discontinuations or switches likely to be related to factors that are prognostic for the outcome? **If N/PN**, answer questions relating to baseline confounding (1.4 to 1.6) **If Y/PY**, answer questions relating to both baseline and time-varying confounding (1.7 and 1.8)		NA / Y / PY / PN / N / NI

Questions relating to baseline confounding only		
1.4. Did the authors use an appropriate analysis method that controlled for all the important confounding domains?	N	NA / Y / PY / PN / N / NI
1.5. **If Y/PY to 1.4**: Were confounding domains that were controlled for measured validly and reliably by the variables available in this study?		NA / Y / PY / PN / N / NI
1.6. Did the authors control for any post-intervention variables that could have been affected by the intervention?	N	NA / Y / PY / PN / N / NI
Questions relating to baseline and time-varying confounding		
1.7. Did the authors use an appropriate analysis method that controlled for all the important confounding domains and for time-varying confounding?	N	NA / Y / PY / PN / N / NI
1.8. **If Y/PY to 1.7**: Were confounding domains that were controlled for measured validly and reliably by the variables available in this study?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Serious	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to confounding?	Favours comparator	Favours experimental / Favours comparator / Unpredictable

Bias in selection of participants into the study		
2.1. Was selection of participants into the study (or into the analysis) based on participant characteristics observed after the start of intervention? **If N/PN to 2.1:** go to 2.4	N	Y / PY / PN / N / NI
2.2. **If Y/PY to 2.1**: Were the post-intervention variables that influenced selection likely to be associated with intervention?		NA / Y / PY / PN / N / NI
2.3 **If Y/PY to 2.2**: Were the post-intervention variables that influenced selection likely to be influenced by the outcome or a cause of the outcome?		NA / Y / PY / PN / N / NI
2.4. Do start of follow-up and start of intervention coincide for most participants?	Y	Y / PY / PN / N / NI
2.5. **If Y/PY to 2.2 and 2.3, or N/PN to 2.4**: Were adjustment techniques used that are likely to correct for the presence of selection biases?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to selection of participants into the study?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in classification of interventions		
3.1 Were intervention groups clearly defined?	Y	Y / PY / PN / N / NI
3.2 Was the information used to define intervention groups recorded at the start of the intervention?	N	Y / PY / PN / N / NI
3.3 Could classification of intervention status have been affected by knowledge of the outcome or risk of the outcome?	N	Y / PY / PN / N / NI
Risk of bias judgement	Moderate	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to classification of interventions?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias due to deviations from intended interventions		
If your aim for this study is to assess the effect of assignment to intervention, answer questions 4.1 and 4.2		
4.1. Were there deviations from the intended intervention beyond what would be expected in usual practice?	N	Y / PY / PN / N / NI
4.2. **If Y/PY to 4.1**: Were these deviations from intended intervention unbalanced between groups *and* likely to have affected the outcome?		NA / Y / PY / PN / N / NI
If your aim for this study is to assess the effect of starting and adhering to intervention, answer questions 4.3 to 4.6		
4.3. Were important co-interventions balanced across intervention groups?	NI	Y / PY / PN / N / NI
4.4. Was the intervention implemented successfully for most participants?	Y	Y / PY / PN / N / NI
4.5. Did study participants adhere to the assigned intervention regimen?	Y	Y / PY / PN / N / NI
4.6. **If N/PN to 4.3, 4.4 or 4.5**: Was an appropriate analysis used to estimate the effect of starting and adhering to the intervention?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to deviations from the intended interventions?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias due to missing data		
5.1 Were outcome data available for all, or nearly all, participants?	Y	Y / PY / PN / N / NI
5.2 Were participants excluded due to missing data on intervention status?	Y	Y / PY / PN / N / NI
5.3 Were participants excluded due to missing data on other variables needed for the analysis?	Y	Y / PY / PN / N / NI
5.4 **If PN/N to 5.1, or Y/PY to 5.2 or 5.3**: Are the proportion of participants and reasons for missing data similar across interventions?		NA / Y / PY / PN / N / NI
5.5 **If PN/N to 5.1, or Y/PY to 5.2 or 5.3**: Is there evidence that results were robust to the presence of missing data?	N	NA / Y / PY / PN / N / NI
Risk of bias judgement	Serious	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to missing data?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in measurement of outcomes		
6.1 Could the outcome measure have been influenced by knowledge of the intervention received?	N	Y / PY / PN / N / NI
6.2 Were outcome assessors aware of the intervention received by study participants?	Y	Y / PY / PN / N / NI
6.3 Were the methods of outcome assessment comparable across intervention groups?	Y	Y / PY / PN / N / NI
6.4 Were any systematic errors in measurement of the outcome related to intervention received?	N	Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to measurement of outcomes?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in selection of the reported result		
Is the reported effect estimate likely to be selected, on the basis of the results, from... 7.1. ... multiple outcome *measurements* within the outcome domain?	N	Y / PY / PN / N / NI
7.2 ... multiple *analyses* of the intervention-outcome relationship?	N	Y / PY / PN / N / NI
7.3 ... different *subgroups*?	N	Y / PY / PN / N / NI
Risk of bias judgement	LOW	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to selection of the reported result?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Overall bias		
Risk of bias judgement	Serious	Low / Moderate / Serious / Critical / NI
Optional: What is the overall predicted direction of bias for this outcome?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

The Risk Of Bias In Non-randomized Studies – of Interventions (ROBINS-I) assessment tool

(version for cohort-type studies)

Version 19 September 2016

ROBINS-I tool (Stage I): At protocol stage

Specify the review question

Participants	Ole Ovesen, Stig Storgaard Jakobsen
Experimental intervention	Periacatabular osteotomi over 50 år.
Comparator	Operation med periacetabular osteotomi under 50 år.
Outcomes	1. Patient Related Outcome Score (*eg.* WOMAC; HOOS, OHS, HHS, FJS, SF-36, EQ-5D) 2. Konversion til THA 3. Komplikation (Stor –The Clavien-Dindo Classification of Surgical Complications grade III/IV) samt iatrogen nervelæsion, iatrogen karlæsion)

List the confounding domains relevant to all or most studies

Artrose/degeneration, BMI, Kongruens, Komorbiditet,

List co-interventions that could be different between intervention groups and that could impact on outcomes

Ingen

ROBINS-I tool (Stage II): For each study

Specify a target randomized trial specific to the study

Design	Individually randomized / Cluster randomized / Matched (e.g. cross-over)
Participants	Petrie et al. 2020, What Is the Impact of Periacetabular Osteotomy Surgery on Patient Function and Activity Levels?
Experimental intervention	
Comparator	

Is your aim for this study…?

☐ to assess the effect of *assignment to* intervention

☐ to assess the effect of *starting and adhering to* intervention

Specify the outcome

Specify which outcome is being assessed for risk of bias (typically from among those earmarked for the Summary of Findings table). Specify whether this is a proposed benefit or harm of intervention.

Specify the numerical result being assessed

In case of multiple alternative analyses being presented, specify the numeric result (e.g. RR = 1.52 (95% CI 0.83 to 2.77) and/or a reference (e.g. to a table, figure or paragraph) that uniquely defines the result being assessed.

Preliminary consideration of confounders

Complete a row for each important confounding domain (i) listed in the review protocol; and (ii) relevant to the setting of this particular study, or which the study authors identified as potentially important.

"Important" confounding domains are those for which, in the context of this study, adjustment is expected to lead to a clinically important change in the estimated effect of the intervention. "Validity" refers to whether the confounding variable or variables fully measure the domain, while "reliability" refers to the precision of the measurement (more measurement error means less reliability).

(i) Confounding domains listed in the review protocol				
Confounding domain	Measured variable(s)	Is there evidence that controlling for this variable was unnecessary?*	Is the confounding domain measured validly and reliably by this variable (or these variables)?	OPTIONAL: Is failure to adjust for this variable (alone) expected to favour the experimental intervention or the comparator?
			Yes / No / No information	Favour experimental / Favour comparator / No information
Artrose/Degeneration	Tönnis grade	No	Yes	Favour comparator
BMI	Weight	No	Yes	No information
Congruency	Sphericity index (Severin)	No	Yes	No Information
Comobidity	Restrictive ambulation	No	No	No information

(ii) Additional confounding domains relevant to the setting of this particular study, or which the study authors identified as important				
Confounding domain	Measured variable(s)	Is there evidence that controlling for this variable was unnecessary?*	Is the confounding domain measured validly and reliably by this variable (or these variables)?	OPTIONAL: Is failure to adjust for this variable (alone) expected to favour the experimental intervention or the comparator?
			Yes / No / No information	Favour experimental / Favour comparator / No information

* In the context of a particular study, variables can be demonstrated not to be confounders and so not included in the analysis: (a) if they are not predictive of the outcome; (b) if they are not predictive of intervention; or (c) because adjustment makes no or minimal difference to the estimated effect of the primary parameter. Note that “no statistically significant association” is not the same as “not predictive”.

Preliminary consideration of co-interventions

Complete a row for each important co-intervention (i) listed in the review protocol; and (ii) relevant to the setting of this particular study, or which the study authors identified as important.

"Important" co-interventions are those for which, in the context of this study, adjustment is expected to lead to a clinically important change in the estimated effect of the intervention.

(i) Co-interventions listed in the review protocol		
Co-intervention	Is there evidence that controlling for this co-intervention was unnecessary (e.g. because it was not administered)?	Is presence of this co-intervention likely to favour outcomes in the experimental intervention or the comparator
NA		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information

(ii) Additional co-interventions relevant to the setting of this particular study, or which the study authors identified as important		
Co-intervention	Is there evidence that controlling for this co-intervention was unnecessary (e.g. because it was not administered)?	Is presence of this co-intervention likely to favour outcomes in the experimental intervention or the comparator
NA		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information

Risk of bias assessment

Responses underlined in green are potential markers for low risk of bias, and responses in red are potential markers for a risk of bias. Where questions relate only to sign posts to other questions, no formatting is used.

Signalling questions	Description	Response options
Bias due to confounding		
1.1 Is there potential for confounding of the effect of intervention in this study? **If N/PN to 1.1:** the study can be considered to be at low risk of bias due to confounding and no further signalling questions need be considered	Y	Y / PY / PN / N
If Y/PY to 1.1: determine whether there is a need to assess time-varying confounding:		
1.2. Was the analysis based on splitting participants' follow up time according to intervention received? **If N/PN**, answer questions relating to baseline confounding (1.4 to 1.6) **If Y/PY**, go to question 1.3.	N	NA / Y / PY / PN / N / NI
1.3. Were intervention discontinuations or switches likely to be related to factors that are prognostic for the outcome? **If N/PN**, answer questions relating to baseline confounding (1.4 to 1.6) **If Y/PY**, answer questions relating to both baseline and time-varying confounding (1.7 and 1.8)		NA / Y / PY / PN / N / NI

Questions relating to baseline confounding only		
1.4. Did the authors use an appropriate analysis method that controlled for all the important confounding domains?	Y	NA / Y / PY / PN / N / NI
1.5. **If Y/PY to 1.4**: Were confounding domains that were controlled for measured validly and reliably by the variables available in this study?	Y	NA / Y / PY / PN / N / NI
1.6. Did the authors control for any post-intervention variables that could have been affected by the intervention?	N	NA / Y / PY / PN / N / NI
Questions relating to baseline and time-varying confounding		
1.7. Did the authors use an appropriate analysis method that controlled for all the important confounding domains and for time-varying confounding?	N	NA / Y / PY / PN / N / NI
1.8. **If Y/PY to 1.7**: Were confounding domains that were controlled for measured validly and reliably by the variables available in this study?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Moderate	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to confounding?	Unpredictable	Favours experimental / Favours comparator / Unpredictable

Bias in selection of participants into the study		
2.1. Was selection of participants into the study (or into the analysis) based on participant characteristics observed after the start of intervention? **If N/PN to 2.1:** go to 2.4	N	Y / PY / PN / N / NI
2.2. **If Y/PY to 2.1**: Were the post-intervention variables that influenced selection likely to be associated with intervention?		NA / Y / PY / PN / N / NI
2.3 **If Y/PY to 2.2**: Were the post-intervention variables that influenced selection likely to be influenced by the outcome or a cause of the outcome?		NA / Y / PY / PN / N / NI
2.4. Do start of follow-up and start of intervention coincide for most participants?	Y	Y / PY / PN / N / NI
2.5. **If Y/PY to 2.2 and 2.3, or N/PN to 2.4**: Were adjustment techniques used that are likely to correct for the presence of selection biases?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to selection of participants into the study?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in classification of interventions		
3.1 Were intervention groups clearly defined?	Y	Y / PY / PN / N / NI
3.2 Was the information used to define intervention groups recorded at the start of the intervention?	N	Y / PY / PN / N / NI
3.3 Could classification of intervention status have been affected by knowledge of the outcome or risk of the outcome?	N	Y / PY / PN / N / NI
Risk of bias judgement	Moderate	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to classification of interventions?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias due to deviations from intended interventions		
If your aim for this study is to assess the effect of assignment to intervention, answer questions 4.1 and 4.2		
4.1. Were there deviations from the intended intervention beyond what would be expected in usual practice?	N	Y / PY / PN / N / NI
4.2. **If Y/PY to 4.1**: Were these deviations from intended intervention unbalanced between groups *and* likely to have affected the outcome?		NA / Y / PY / PN / N / NI
If your aim for this study is to assess the effect of starting and adhering to intervention, answer questions 4.3 to 4.6		
4.3. Were important co-interventions balanced across intervention groups?	NI	Y / PY / PN / N / NI
4.4. Was the intervention implemented successfully for most participants?	Y	Y / PY / PN / N / NI
4.5. Did study participants adhere to the assigned intervention regimen?	Y	Y / PY / PN / N / NI
4.6. **If N/PN to 4.3, 4.4 or 4.5**: Was an appropriate analysis used to estimate the effect of starting and adhering to the intervention?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to deviations from the intended interventions?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias due to missing data		
5.1 Were outcome data available for all, or nearly all, participants?	NI	Y / PY / PN / N / NI
5.2 Were participants excluded due to missing data on intervention status?	NI	Y / PY / PN / N / NI
5.3 Were participants excluded due to missing data on other variables needed for the analysis?	NI	Y / PY / PN / N / NI
5.4 **If PN/N to 5.1, or Y/PY to 5.2 or 5.3**: Are the proportion of participants and reasons for missing data similar across interventions?		NA / Y / PY / PN / N / NI
5.5 **If PN/N to 5.1, or Y/PY to 5.2 or 5.3**: Is there evidence that results were robust to the presence of missing data?	NI	NA / Y / PY / PN / N / NI
Risk of bias judgement	Serious	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to missing data?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in measurement of outcomes		
6.1 Could the outcome measure have been influenced by knowledge of the intervention received?	N	Y / PY / PN / N / NI
6.2 Were outcome assessors aware of the intervention received by study participants?	Y	Y / PY / PN / N / NI
6.3 Were the methods of outcome assessment comparable across intervention groups?	Y	Y / PY / PN / N / NI
6.4 Were any systematic errors in measurement of the outcome related to intervention received?	N	Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to measurement of outcomes?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in selection of the reported result		
Is the reported effect estimate likely to be selected, on the basis of the results, from... 7.1. ... multiple outcome *measurements* within the outcome domain?	N	Y / PY / PN / N / NI
7.2 ... multiple *analyses* of the intervention-outcome relationship?	N	Y / PY / PN / N / NI
7.3 ... different *subgroups*?	N	Y / PY / PN / N / NI
Risk of bias judgement	LOW	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to selection of the reported result?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Overall bias		
Risk of bias judgement	Moderate	Low / Moderate / Serious / Critical / NI
Optional: What is the overall predicted direction of bias for this outcome?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

The Risk Of Bias In Non-randomized Studies – of Interventions (ROBINS-I) assessment tool

(version for cohort-type studies)

Version 19 September 2016

ROBINS-I tool (Stage I): At protocol stage

Specify the review question

Participants	Ole Ovesen, Stig Storgaard Jakobsen
Experimental intervention	Periacatabular osteotomi over 50 år.
Comparator	Operation med periacetabular osteotomi under 50 år.
Outcomes	1. Patient Related Outcome Score (*eg.* WOMAC; HOOS, OHS, HHS, FJS, SF-36, EQ-5D) 2. Konversion til THA 3. Komplikation (Stor –The Clavien-Dindo Classification of Surgical Complications grade III/IV) samt iatrogen nervelæsion, iatrogen karlæsion)

List the confounding domains relevant to all or most studies

Artrose/degeneration, BMI, Kongruens, Komorbiditet,

List co-interventions that could be different between intervention groups and that could impact on outcomes

Ingen

ROBINS-I tool (Stage II): For each study

Specify a target randomized trial specific to the study

Design	Individually randomized / Cluster randomized / Matched (e.g. cross-over)
Participants	Ziran et al. 2019: Ten- and 20-year Survivorship of the Hip After Periacetabular Osteotomy for Acetabular Dysplasia
Experimental intervention	
Comparator	

Is your aim for this study…?

☐ to assess the effect of *assignment to* intervention

☐ to assess the effect of *starting and adhering to* intervention

Specify the outcome

Specify which outcome is being assessed for risk of bias (typically from among those earmarked for the Summary of Findings table). Specify whether this is a proposed benefit or harm of intervention.

Specify the numerical result being assessed

In case of multiple alternative analyses being presented, specify the numeric result (e.g. RR = 1.52 (95% CI 0.83 to 2.77) and/or a reference (e.g. to a table, figure or paragraph) that uniquely defines the result being assessed.

Preliminary consideration of confounders

Complete a row for each important confounding domain (i) listed in the review protocol; and (ii) relevant to the setting of this particular study, or which the study authors identified as potentially important.

"Important" confounding domains are those for which, in the context of this study, adjustment is expected to lead to a clinically important change in the estimated effect of the intervention. "Validity" refers to whether the confounding variable or variables fully measure the domain, while "reliability" refers to the precision of the measurement (more measurement error means less reliability).

(i) Confounding domains listed in the review protocol				
Confounding domain	Measured variable(s)	Is there evidence that controlling for this variable was unnecessary?*	Is the confounding domain measured validly and reliably by this variable (or these variables)?	OPTIONAL: Is failure to adjust for this variable (alone) expected to favour the experimental intervention or the comparator?
			Yes / No / No information	Favour experimental / Favour comparator / No information
Artrose/Degeneration	Tönnis grade	No	Yes	Favour comparator
BMI	Weight	No	Yes	No information
Congruency	Sphericity index (Severin)	No	Yes	No Information
Comobidity	Restrictive ambulation	No	No	No information

(ii) Additional confounding domains relevant to the setting of this particular study, or which the study authors identified as important				
Confounding domain	Measured variable(s)	Is there evidence that controlling for this variable was unnecessary?*	Is the confounding domain measured validly and reliably by this variable (or these variables)?	OPTIONAL: Is failure to adjust for this variable (alone) expected to favour the experimental intervention or the comparator?
			Yes / No / No information	Favour experimental / Favour comparator / No information

* In the context of a particular study, variables can be demonstrated not to be confounders and so not included in the analysis: (a) if they are not predictive of the outcome; (b) if they are not predictive of intervention; or (c) because adjustment makes no or minimal difference to the estimated effect of the primary parameter. Note that “no statistically significant association” is not the same as “not predictive”.

Preliminary consideration of co-interventions

Complete a row for each important co-intervention (i) listed in the review protocol; and (ii) relevant to the setting of this particular study, or which the study authors identified as important.

"Important" co-interventions are those for which, in the context of this study, adjustment is expected to lead to a clinically important change in the estimated effect of the intervention.

(i) Co-interventions listed in the review protocol		
Co-intervention	Is there evidence that controlling for this co-intervention was unnecessary (e.g. because it was not administered)?	Is presence of this co-intervention likely to favour outcomes in the experimental intervention or the comparator
NA		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information

(ii) Additional co-interventions relevant to the setting of this particular study, or which the study authors identified as important		
Co-intervention	Is there evidence that controlling for this co-intervention was unnecessary (e.g. because it was not administered)?	Is presence of this co-intervention likely to favour outcomes in the experimental intervention or the comparator
NA		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information

Risk of bias assessment

Responses underlined in green are potential markers for low risk of bias, and responses in red are potential markers for a risk of bias. Where questions relate only to sign posts to other questions, no formatting is used.

Signalling questions	Description	Response options
Bias due to confounding		
1.1 Is there potential for confounding of the effect of intervention in this study? **If N/PN to 1.1:** the study can be considered to be at low risk of bias due to confounding and no further signalling questions need be considered	Y	Y / PY / PN / N
If Y/PY to 1.1: determine whether there is a need to assess time-varying confounding:		
1.2. Was the analysis based on splitting participants' follow up time according to intervention received? **If N/PN**, answer questions relating to baseline confounding (1.4 to 1.6) **If Y/PY**, go to question 1.3.	N	NA / Y / PY / PN / N / NI
1.3. Were intervention discontinuations or switches likely to be related to factors that are prognostic for the outcome? **If N/PN**, answer questions relating to baseline confounding (1.4 to 1.6) **If Y/PY**, answer questions relating to both baseline and time-varying confounding (1.7 and 1.8)		NA / Y / PY / PN / N / NI

Questions relating to baseline confounding only		
1.4. Did the authors use an appropriate analysis method that controlled for all the important confounding domains?	Y	NA / Y / PY / PN / N / NI
1.5. **If Y/PY to 1.4**: Were confounding domains that were controlled for measured validly and reliably by the variables available in this study?	Y	NA / Y / PY / PN / N / NI
1.6. Did the authors control for any post-intervention variables that could have been affected by the intervention?	N	NA / Y / PY / PN / N / NI
Questions relating to baseline and time-varying confounding		
1.7. Did the authors use an appropriate analysis method that controlled for all the important confounding domains and for time-varying confounding?	N	NA / Y / PY / PN / N / NI
1.8. **If Y/PY to 1.7**: Were confounding domains that were controlled for measured validly and reliably by the variables available in this study?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Moderate	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to confounding?	Unpredictable	Favours experimental / Favours comparator / Unpredictable

Bias in selection of participants into the study		
2.1. Was selection of participants into the study (or into the analysis) based on participant characteristics observed after the start of intervention? **If N/PN to 2.1:** go to 2.4	Y	Y / PY / PN / N / NI
2.2. **If Y/PY to 2.1**: Were the post-intervention variables that influenced selection likely to be associated with intervention?	Y	NA / Y / PY / PN / N / NI
2.3 **If Y/PY to 2.2**: Were the post-intervention variables that influenced selection likely to be influenced by the outcome or a cause of the outcome?	Y	NA / Y / PY / PN / N / NI
2.4. Do start of follow-up and start of intervention coincide for most participants?	Y	Y / PY / PN / N / NI
2.5. **If Y/PY to 2.2 and 2.3, or N/PN to 2.4**: Were adjustment techniques used that are likely to correct for the presence of selection biases?	Y	NA / Y / PY / PN / N / NI
Risk of bias judgement	Moderate	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to selection of participants into the study?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in classification of interventions		
3.1 Were intervention groups clearly defined?	Y	Y / PY / PN / N / NI
3.2 Was the information used to define intervention groups recorded at the start of the intervention?	N	Y / PY / PN / N / NI
3.3 Could classification of intervention status have been affected by knowledge of the outcome or risk of the outcome?	N	Y / PY / PN / N / NI
Risk of bias judgement	Moderate	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to classification of interventions?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias due to deviations from intended interventions		
If your aim for this study is to assess the effect of assignment to intervention, answer questions 4.1 and 4.2		
4.1. Were there deviations from the intended intervention beyond what would be expected in usual practice?	N	Y / PY / PN / N / NI
4.2. **If Y/PY to 4.1**: Were these deviations from intended intervention unbalanced between groups *and* likely to have affected the outcome?	PN	NA / Y / PY / PN / N / NI
If your aim for this study is to assess the effect of starting and adhering to intervention, answer questions 4.3 to 4.6		
4.3. Were important co-interventions balanced across intervention groups?	PY	Y / PY / PN / N / NI
4.4. Was the intervention implemented successfully for most participants?	Y	Y / PY / PN / N / NI
4.5. Did study participants adhere to the assigned intervention regimen?	Y	Y / PY / PN / N / NI
4.6. **If N/PN to 4.3, 4.4 or 4.5**: Was an appropriate analysis used to estimate the effect of starting and adhering to the intervention?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Low	
Optional: What is the predicted direction of bias due to deviations from the intended interventions?	Towards null	

Bias due to missing data		
5.1 Were outcome data available for all, or nearly all, participants?	N	Y / PY / PN / N / NI
5.2 Were participants excluded due to missing data on intervention status?	N	Y / PY / PN / N / NI
5.3 Were participants excluded due to missing data on other variables needed for the analysis?	N	Y / PY / PN / N / NI
5.4 **If PN/N to 5.1, or Y/PY to 5.2 or 5.3**: Are the proportion of participants and reasons for missing data similar across interventions?	PY	NA / Y / PY / PN / N / NI
5.5 **If PN/N to 5.1, or Y/PY to 5.2 or 5.3**: Is there evidence that results were robust to the presence of missing data?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Serious	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to missing data?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in measurement of outcomes		
6.1 Could the outcome measure have been influenced by knowledge of the intervention received?	N	Y / PY / PN / N / NI
6.2 Were outcome assessors aware of the intervention received by study participants?	Y	Y / PY / PN / N / NI
6.3 Were the methods of outcome assessment comparable across intervention groups?	Y	Y / PY / PN / N / NI
6.4 Were any systematic errors in measurement of the outcome related to intervention received?	N	Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to measurement of outcomes?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in selection of the reported result		
Is the reported effect estimate likely to be selected, on the basis of the results, from... 7.1. ... multiple outcome *measurements* within the outcome domain?	N	Y / PY / PN / N / NI
7.2 ... multiple *analyses* of the intervention-outcome relationship?	N	Y / PY / PN / N / NI
7.3 ... different *subgroups*?	N	Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to selection of the reported result?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Overall bias		
Risk of bias judgement	Moderate	Low / Moderate / Serious / Critical / NI
Optional: What is the overall predicted direction of bias for this outcome?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

The Risk Of Bias In Non-randomized Studies – of Interventions (ROBINS-I) assessment tool

(version for cohort-type studies)

Version 19 September 2016

ROBINS-I tool (Stage I): At protocol stage

Specify the review question

Participants	Ole Ovesen, Stig Storgaard Jakobsen
Experimental intervention	Periacatabular osteotomi over 50 år.
Comparator	Operation med periacetabular osteotomi under 50 år.
Outcomes	1. Patient Related Outcome Score (*eg.* WOMAC; HOOS, OHS, HHS, FJS, SF-36, EQ-5D) 2. Konversion til THA 3. Komplikation (Stor –The Clavien-Dindo Classification of Surgical Complications grade III/IV) samt iatrogen nervelæsion, iatrogen karlæsion)

List the confounding domains relevant to all or most studies

Artrose/degeneration, BMI, Kongruens, Komorbiditet,

List co-interventions that could be different between intervention groups and that could impact on outcomes

Ingen

ROBINS-I tool (Stage II): For each study

Specify a target randomized trial specific to the study

Design	Individually randomized / Cluster randomized / Matched (e.g. cross-over)
Participants	Isaksen et al 2019, Preoperative incipient osteoarthritis predicts failure after periacetabular osteotomy: 69 hips operated through the anterior intrapelvic approach
Experimental intervention	
Comparator	

Is your aim for this study…?

☐ to assess the effect of *assignment to* intervention

☐ to assess the effect of *starting and adhering to* intervention

Specify the outcome

Specify which outcome is being assessed for risk of bias (typically from among those earmarked for the Summary of Findings table). Specify whether this is a proposed benefit or harm of intervention.

Specify the numerical result being assessed

In case of multiple alternative analyses being presented, specify the numeric result (e.g. RR = 1.52 (95% CI 0.83 to 2.77) and/or a reference (e.g. to a table, figure or paragraph) that uniquely defines the result being assessed.

Preliminary consideration of confounders

Complete a row for each important confounding domain (i) listed in the review protocol; and (ii) relevant to the setting of this particular study, or which the study authors identified as potentially important.

"Important" confounding domains are those for which, in the context of this study, adjustment is expected to lead to a clinically important change in the estimated effect of the intervention. "Validity" refers to whether the confounding variable or variables fully measure the domain, while "reliability" refers to the precision of the measurement (more measurement error means less reliability).

(i) Confounding domains listed in the review protocol				
Confounding domain	Measured variable(s)	Is there evidence that controlling for this variable was unnecessary?*	Is the confounding domain measured validly and reliably by this variable (or these variables)?	OPTIONAL: Is failure to adjust for this variable (alone) expected to favour the experimental intervention or the comparator?
			Yes / No / No information	Favour experimental / Favour comparator / No information
Artrose/Degeneration	Tönnis grade	No	Yes	Favour comparator
BMI	Weight	No	Yes	No information
Congruency	Sphericity index (Severin)	No	Yes	No Information
Comobidity	Restrictive ambulation	No	No	No information

(ii) Additional confounding domains relevant to the setting of this particular study, or which the study authors identified as important				
Confounding domain	Measured variable(s)	Is there evidence that controlling for this variable was unnecessary?*	Is the confounding domain measured validly and reliably by this variable (or these variables)?	OPTIONAL: Is failure to adjust for this variable (alone) expected to favour the experimental intervention or the comparator?
			Yes / No / No information	Favour experimental / Favour comparator / No information

* In the context of a particular study, variables can be demonstrated not to be confounders and so not included in the analysis: (a) if they are not predictive of the outcome; (b) if they are not predictive of intervention; or (c) because adjustment makes no or minimal difference to the estimated effect of the primary parameter. Note that “no statistically significant association” is not the same as “not predictive”.

Preliminary consideration of co-interventions

Complete a row for each important co-intervention (i) listed in the review protocol; and (ii) relevant to the setting of this particular study, or which the study authors identified as important.

"Important" co-interventions are those for which, in the context of this study, adjustment is expected to lead to a clinically important change in the estimated effect of the intervention.

(i) Co-interventions listed in the review protocol		
Co-intervention	Is there evidence that controlling for this co-intervention was unnecessary (e.g. because it was not administered)?	Is presence of this co-intervention likely to favour outcomes in the experimental intervention or the comparator
NA		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information

(ii) Additional co-interventions relevant to the setting of this particular study, or which the study authors identified as important		
Co-intervention	Is there evidence that controlling for this co-intervention was unnecessary (e.g. because it was not administered)?	Is presence of this co-intervention likely to favour outcomes in the experimental intervention or the comparator
NA		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information

Risk of bias assessment

Responses underlined in green are potential markers for low risk of bias, and responses in red are potential markers for a risk of bias. Where questions relate only to sign posts to other questions, no formatting is used.

Signalling questions	Description	Response options
Bias due to confounding		
1.1 Is there potential for confounding of the effect of intervention in this study? **If N/PN to 1.1:** the study can be considered to be at low risk of bias due to confounding and no further signalling questions need be considered	Y	Y / PY / PN / N
If Y/PY to 1.1: determine whether there is a need to assess time-varying confounding:		
1.2. Was the analysis based on splitting participants' follow up time according to intervention received? **If N/PN**, answer questions relating to baseline confounding (1.4 to 1.6) **If Y/PY**, go to question 1.3.	N	NA / Y / PY / PN / N / NI
1.3. Were intervention discontinuations or switches likely to be related to factors that are prognostic for the outcome? **If N/PN**, answer questions relating to baseline confounding (1.4 to 1.6) **If Y/PY**, answer questions relating to both baseline and time-varying confounding (1.7 and 1.8)		NA / Y / PY / PN / N / NI

Questions relating to baseline confounding only		
1.4. Did the authors use an appropriate analysis method that controlled for all the important confounding domains?	PY	NA / Y / PY / PN / N / NI
1.5. **If Y/PY to 1.4**: Were confounding domains that were controlled for measured validly and reliably by the variables available in this study?	Y	NA / Y / PY / PN / N / NI
1.6. Did the authors control for any post-intervention variables that could have been affected by the intervention?	NI	NA / Y / PY / PN / N / NI
Questions relating to baseline and time-varying confounding		
1.7. Did the authors use an appropriate analysis method that controlled for all the important confounding domains and for time-varying confounding?	N	NA / Y / PY / PN / N / NI
1.8. **If Y/PY to 1.7**: Were confounding domains that were controlled for measured validly and reliably by the variables available in this study?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Moderate	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to confounding?	Unpredictable	Favours experimental / Favours comparator / Unpredictable

Bias in selection of participants into the study		
2.1. Was selection of participants into the study (or into the analysis) based on participant characteristics observed after the start of intervention? **If N/PN to 2.1:** go to 2.4	N	Y / PY / PN / N / NI
2.2. **If Y/PY to 2.1**: Were the post-intervention variables that influenced selection likely to be associated with intervention?		NA / Y / PY / PN / N / NI
2.3 **If Y/PY to 2.2**: Were the post-intervention variables that influenced selection likely to be influenced by the outcome or a cause of the outcome?		NA / Y / PY / PN / N / NI
2.4. Do start of follow-up and start of intervention coincide for most participants?	Y	Y / PY / PN / N / NI
2.5. **If Y/PY to 2.2 and 2.3, or N/PN to 2.4**: Were adjustment techniques used that are likely to correct for the presence of selection biases?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to selection of participants into the study?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in classification of interventions		
3.1 Were intervention groups clearly defined?	Y	Y / PY / PN / N / NI
3.2 Was the information used to define intervention groups recorded at the start of the intervention?	Y	Y / PY / PN / N / NI
3.3 Could classification of intervention status have been affected by knowledge of the outcome or risk of the outcome?	N	Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to classification of interventions?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias due to deviations from intended interventions		
If your aim for this study is to assess the effect of assignment to intervention, answer questions 4.1 and 4.2		
4.1. Were there deviations from the intended intervention beyond what would be expected in usual practice?	N	Y / PY / PN / N / NI
4.2. **If Y/PY to 4.1**: Were these deviations from intended intervention unbalanced between groups *and* likely to have affected the outcome?	PN	NA / Y / PY / PN / N / NI
If your aim for this study is to assess the effect of starting and adhering to intervention, answer questions 4.3 to 4.6		
4.3. Were important co-interventions balanced across intervention groups?	NI	Y / PY / PN / N / NI
4.4. Was the intervention implemented successfully for most participants?	Y	Y / PY / PN / N / NI
4.5. Did study participants adhere to the assigned intervention regimen?	Y	Y / PY / PN / N / NI
4.6. **If N/PN to 4.3, 4.4 or 4.5**: Was an appropriate analysis used to estimate the effect of starting and adhering to the intervention?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Low	
Optional: What is the predicted direction of bias due to deviations from the intended interventions?	Towards null	

Bias due to missing data		
5.1 Were outcome data available for all, or nearly all, participants?	Y	Y / PY / PN / N / NI
5.2 Were participants excluded due to missing data on intervention status?	N	Y / PY / PN / N / NI
5.3 Were participants excluded due to missing data on other variables needed for the analysis?	N	Y / PY / PN / N / NI
5.4 **If PN/N to 5.1, or Y/PY to 5.2 or 5.3**: Are the proportion of participants and reasons for missing data similar across interventions?		NA / Y / PY / PN / N / NI
5.5 **If PN/N to 5.1, or Y/PY to 5.2 or 5.3**: Is there evidence that results were robust to the presence of missing data?	N	NA / Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to missing data?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in measurement of outcomes		
6.1 Could the outcome measure have been influenced by knowledge of the intervention received?	N	Y / PY / PN / N / NI
6.2 Were outcome assessors aware of the intervention received by study participants?	Y	Y / PY / PN / N / NI
6.3 Were the methods of outcome assessment comparable across intervention groups?	Y	Y / PY / PN / N / NI
6.4 Were any systematic errors in measurement of the outcome related to intervention received?	N	Y / PY / PN / N / NI
Risk of bias judgement	Moderate	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to measurement of outcomes?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in selection of the reported result		
Is the reported effect estimate likely to be selected, on the basis of the results, from... 7.1. ... multiple outcome *measurements* within the outcome domain?	N	Y / PY / PN / N / NI
7.2 ... multiple *analyses* of the intervention-outcome relationship?	N	Y / PY / PN / N / NI
7.3 ... different *subgroups*?	N	Y / PY / PN / N / NI
Risk of bias judgement	LOW	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to selection of the reported result?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Overall bias		
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the overall predicted direction of bias for this outcome?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

The Risk Of Bias In Non-randomized Studies – of Interventions (ROBINS-I) assessment tool

(version for cohort-type studies)

Version 19 September 2016

ROBINS-I tool (Stage I): At protocol stage

Specify the review question

Participants	Ole Ovesen, Stig Storgaard Jakobsen
Experimental intervention	Periacatabular osteotomi over 50 år.
Comparator	Operation med periacetabular osteotomi under 50 år.
Outcomes	1. Patient Related Outcome Score (*eg.* WOMAC; HOOS, OHS, HHS, FJS, SF-36, EQ-5D) 2. Konversion til THA 3. Komplikation (Stor –The Clavien-Dindo Classification of Surgical Complications grade III/IV) samt iatrogen nervelæsion, iatrogen karlæsion)

List the confounding domains relevant to all or most studies

Artrose/degeneration, BMI, Kongruens, Komorbiditet,

List co-interventions that could be different between intervention groups and that could impact on outcomes

Ingen

ROBINS-I tool (Stage II): For each study

Specify a target randomized trial specific to the study

Design	Individually randomized / Cluster randomized / Matched (e.g. cross-over)
Participants	Imai et al 2020, Outcomes of computer-assisted peri-acetabular osteotomy compared with conventional osteotomy in hip dysplasia
Experimental intervention	
Comparator	

Is your aim for this study…?

☐ to assess the effect of *assignment to* intervention

☐ to assess the effect of *starting and adhering to* intervention

Specify the outcome

Specify which outcome is being assessed for risk of bias (typically from among those earmarked for the Summary of Findings table). Specify whether this is a proposed benefit or harm of intervention.

Specify the numerical result being assessed

In case of multiple alternative analyses being presented, specify the numeric result (e.g. RR = 1.52 (95% CI 0.83 to 2.77) and/or a reference (e.g. to a table, figure or paragraph) that uniquely defines the result being assessed.

Preliminary consideration of confounders

Complete a row for each important confounding domain (i) listed in the review protocol; and (ii) relevant to the setting of this particular study, or which the study authors identified as potentially important.

"Important" confounding domains are those for which, in the context of this study, adjustment is expected to lead to a clinically important change in the estimated effect of the intervention. "Validity" refers to whether the confounding variable or variables fully measure the domain, while "reliability" refers to the precision of the measurement (more measurement error means less reliability).

(i) Confounding domains listed in the review protocol				
Confounding domain	Measured variable(s)	Is there evidence that controlling for this variable was unnecessary?*	Is the confounding domain measured validly and reliably by this variable (or these variables)?	OPTIONAL: Is failure to adjust for this variable (alone) expected to favour the experimental intervention or the comparator?
			Yes / No / No information	Favour experimental / Favour comparator / No information
Artrose/Degeneration	Tönnis grade	No	Yes	Favour comparator
BMI	Weight	No	Yes	No information
Congruency	Sphericity index (Severin)	No	Yes	No Information
Comobidity	Restrictive ambulation	No	No	No information

(ii) Additional confounding domains relevant to the setting of this particular study, or which the study authors identified as important				
Confounding domain	Measured variable(s)	Is there evidence that controlling for this variable was unnecessary?*	Is the confounding domain measured validly and reliably by this variable (or these variables)?	OPTIONAL: Is failure to adjust for this variable (alone) expected to favour the experimental intervention or the comparator?
			Yes / No / No information	Favour experimental / Favour comparator / No information

* In the context of a particular study, variables can be demonstrated not to be confounders and so not included in the analysis: (a) if they are not predictive of the outcome; (b) if they are not predictive of intervention; or (c) because adjustment makes no or minimal difference to the estimated effect of the primary parameter. Note that “no statistically significant association” is not the same as “not predictive”.

Preliminary consideration of co-interventions

Complete a row for each important co-intervention (i) listed in the review protocol; and (ii) relevant to the setting of this particular study, or which the study authors identified as important.

"Important" co-interventions are those for which, in the context of this study, adjustment is expected to lead to a clinically important change in the estimated effect of the intervention.

(i) Co-interventions listed in the review protocol		
Co-intervention	Is there evidence that controlling for this co-intervention was unnecessary (e.g. because it was not administered)?	Is presence of this co-intervention likely to favour outcomes in the experimental intervention or the comparator
NA		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information

(ii) Additional co-interventions relevant to the setting of this particular study, or which the study authors identified as important		
Co-intervention	Is there evidence that controlling for this co-intervention was unnecessary (e.g. because it was not administered)?	Is presence of this co-intervention likely to favour outcomes in the experimental intervention or the comparator
NA		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information
		Favour experimental / Favour comparator / No information

Risk of bias assessment

Responses underlined in green are potential markers for low risk of bias, and responses in red are potential markers for a risk of bias. Where questions relate only to sign posts to other questions, no formatting is used.

Signalling questions	Description	Response options
Bias due to confounding		
1.1 Is there potential for confounding of the effect of intervention in this study? **If N/PN to 1.1:** the study can be considered to be at low risk of bias due to confounding and no further signalling questions need be considered	Y	Y / PY / PN / N
If Y/PY to 1.1: determine whether there is a need to assess time-varying confounding:		
1.2. Was the analysis based on splitting participants' follow up time according to intervention received? **If N/PN**, answer questions relating to baseline confounding (1.4 to 1.6) **If Y/PY**, go to question 1.3.	N	NA / Y / PY / PN / N / NI
1.3. Were intervention discontinuations or switches likely to be related to factors that are prognostic for the outcome? **If N/PN**, answer questions relating to baseline confounding (1.4 to 1.6) **If Y/PY**, answer questions relating to both baseline and time-varying confounding (1.7 and 1.8)		NA / Y / PY / PN / N / NI

Questions relating to baseline confounding only		
1.4. Did the authors use an appropriate analysis method that controlled for all the important confounding domains?	N	NA / Y / PY / PN / N / NI
1.5. **If Y/PY to 1.4**: Were confounding domains that were controlled for measured validly and reliably by the variables available in this study?		NA / Y / PY / PN / N / NI
1.6. Did the authors control for any post-intervention variables that could have been affected by the intervention?	N	NA / Y / PY / PN / N / NI
Questions relating to baseline and time-varying confounding		
1.7. Did the authors use an appropriate analysis method that controlled for all the important confounding domains and for time-varying confounding?	Y	NA / Y / PY / PN / N / NI
1.8. **If Y/PY to 1.7**: Were confounding domains that were controlled for measured validly and reliably by the variables available in this study?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Moderate	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to confounding?	Unpredictable	Favours experimental / Favours comparator / Unpredictable

Bias in selection of participants into the study		
2.1. Was selection of participants into the study (or into the analysis) based on participant characteristics observed after the start of intervention? **If N/PN to 2.1:** go to 2.4	N	Y / PY / PN / N / NI
2.2. **If Y/PY to 2.1**: Were the post-intervention variables that influenced selection likely to be associated with intervention?		NA / Y / PY / PN / N / NI
2.3 **If Y/PY to 2.2**: Were the post-intervention variables that influenced selection likely to be influenced by the outcome or a cause of the outcome?		NA / Y / PY / PN / N / NI
2.4. Do start of follow-up and start of intervention coincide for most participants?	Y	Y / PY / PN / N / NI
2.5. **If Y/PY to 2.2 and 2.3, or N/PN to 2.4**: Were adjustment techniques used that are likely to correct for the presence of selection biases?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to selection of participants into the study?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in classification of interventions		
3.1 Were intervention groups clearly defined?	Y	Y / PY / PN / N / NI
3.2 Was the information used to define intervention groups recorded at the start of the intervention?	Y	Y / PY / PN / N / NI
3.3 Could classification of intervention status have been affected by knowledge of the outcome or risk of the outcome?	N	Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to classification of interventions?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias due to deviations from intended interventions		
If your aim for this study is to assess the effect of assignment to intervention, answer questions 4.1 and 4.2		
4.1. Were there deviations from the intended intervention beyond what would be expected in usual practice?	N	Y / PY / PN / N / NI
4.2. **If Y/PY to 4.1**: Were these deviations from intended intervention unbalanced between groups *and* likely to have affected the outcome?		NA / Y / PY / PN / N / NI
If your aim for this study is to assess the effect of starting and adhering to intervention, answer questions 4.3 to 4.6		
4.3. Were important co-interventions balanced across intervention groups?	NI	Y / PY / PN / N / NI
4.4. Was the intervention implemented successfully for most participants?	Y	Y / PY / PN / N / NI
4.5. Did study participants adhere to the assigned intervention regimen?	Y	Y / PY / PN / N / NI
4.6. **If N/PN to 4.3, 4.4 or 4.5**: Was an appropriate analysis used to estimate the effect of starting and adhering to the intervention?		NA / Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to deviations from the intended interventions?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias due to missing data		
5.1 Were outcome data available for all, or nearly all, participants?	N	Y / PY / PN / N / NI
5.2 Were participants excluded due to missing data on intervention status?	NI	Y / PY / PN / N / NI
5.3 Were participants excluded due to missing data on other variables needed for the analysis?	NI	Y / PY / PN / N / NI
5.4 **If PN/N to 5.1, or Y/PY to 5.2 or 5.3**: Are the proportion of participants and reasons for missing data similar across interventions?		NA / Y / PY / PN / N / NI
5.5 **If PN/N to 5.1, or Y/PY to 5.2 or 5.3**: Is there evidence that results were robust to the presence of missing data?	N	NA / Y / PY / PN / N / NI
Risk of bias judgement	Serious	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to missing data?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in measurement of outcomes		
6.1 Could the outcome measure have been influenced by knowledge of the intervention received?	N	Y / PY / PN / N / NI
6.2 Were outcome assessors aware of the intervention received by study participants?	Y	Y / PY / PN / N / NI
6.3 Were the methods of outcome assessment comparable across intervention groups?	Y	Y / PY / PN / N / NI
6.4 Were any systematic errors in measurement of the outcome related to intervention received?	N	Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to measurement of outcomes?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bias in selection of the reported result		
Is the reported effect estimate likely to be selected, on the basis of the results, from... 7.1. ... multiple outcome *measurements* within the outcome domain?	N	Y / PY / PN / N / NI
7.2 ... multiple *analyses* of the intervention-outcome relationship?	N	Y / PY / PN / N / NI
7.3 ... different *subgroups*?	N	Y / PY / PN / N / NI
Risk of bias judgement	Low	Low / Moderate / Serious / Critical / NI
Optional: What is the predicted direction of bias due to selection of the reported result?	Unpredictable	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Overall bias		
Risk of bias judgement	Seroius	Low / Moderate / Serious / Critical / NI
Optional: What is the overall predicted direction of bias for this outcome?	Towards null	Favours experimental / Favours comparator / Towards null /Away from null / Unpredictable

Bilag 4 - SoF tabel							
Forfatter (årstal)	**Antal hofter (n)**	**Alder (range)**	**Followup (range)**	**PAO operation holdbarhed**	**Alder - Risiko**	**Statistisk korrektion for følgende confoundere.**	**ROBINS-I evaluering**
Tan et al. (2022)	3655	32.6 (12–63)	4.5 (0–28)	4.5y: 94.0%	THA Alder >40y er en risikofaktor for tidlig konvertering til THA fra 7 år og fremefter.		Low
Kristiansen et al. (2022)	1501	29.7 (11-63)	7.6 (0.02 – 24.6)	24y: 71%	THA <29y vs. 30–44y (HR **1.7**, CI 1.1–2.8) <29y vs. ≥ 45y (HR **2.2**, CI 1.2–3.8),	Køn, BMI, Tönnis artrosegrad, tidspunkt for OP	Low
Yilmaz et al. (2022)	43	32 (19-45)	*7.53 (6-15)*		PROM <35y 91.09 ± 3.68 (85-95) >35y 87.5 ± 5 (80-95) p0.01*		Critical
Willey et al. (2022)	198	*29.7 (12.0-54.0)*	13 (10-18)	15y: 76.0%	THA Alder (<30y vs >30y) OR **2.93** (CI1.36-6.30)	Demografi, radiologiske parameter før og efter.	Low
Salih et al. (2020)	223	28.8 (13-48)	2,2	No information	Komplikation 3-fold øgning af risiko for alvorlig komplikation ved alder >40y.	BMI, alder>40y, Tönnis artrosegrad, hypermobilitet.	Lav - Moderate
Imai et al. (2020)	98	39.1 (15-56)	5.4 (3-11)	11y: 84.0%	THA <41y vs >41y p: N.S.		Serious
Larsen et al. (2020)	1385	32.0 (13-59)	5.4 (0.03–14)	14y: 80.0%	THA HR < 20y vs. 20–40y **1.4** (CI 0.6–3.4) HR < 20y vs. > 40y **2.5** (CI 1.03–6.0)	Alder og køn.	Low

Bilag 4 - SoF tabel							
Muffly et al. 2021	391	Ikke angivet	4,71 ()	2y: 98%	PROM >40y forbedret i forhold til < 20y, 20y-29y,30y – 39y) (p<0.02)	Alder, køn, MBI, CE-vinkel, AI-vinkel, Tönnis artrosegrad.	Low
Gu et al. 2021	44	31.2(12-49)	1.6 (1.0-3.9)	1.6y: 100%	PROM Alder <30y vs. >30y har ikke betydning for postoperativ PROM.	Radiologiske mål: The acetabular top tilt angle, CE angle, ABA, EI, sphericity index of femoral head, p/a ratio, AAA	Serious
Petrie et al. 2020	350	25.1 (10.2-53.6)	*3.7 (1.7-7.6)*	3.7y:99.7%	PROM PROM forbedres ved alle aldersgruppe <19y, 19y -29y, >29y. Ved aldersgruppen > 30y blev der fundet den største forbedring i PROM.	Tidligere operation i hoften, samtidig artroskopi, præoperativ CE vinkel, præoperativ BMI>30, køn samt alder.	Moderate
Isaksen et al. 2019	69	32 (14–44)	*7.4 (2–15)*	7.4y: 87%	THA Alder ikke en isoleret risikofaktor. HR **1.05** (0.94–1.18) p0.379 adjHR 1.10 (0.96–1.27) p0.176	Alder, køn, BMI, tilstedeværelse af OA, CE og AI vinkel	Lav til moderate
Ziran et al. 2019	302	32.7 (13-63)	11.2 (2-27)	20y: 60%	THA Alder ved PAO samt begyndende slidgigt er en negative prognostisk faktor for hofteledets bevarelse.		Moderat
Lerch et al. (2017)	63	29y (13-56)	29y (27-32)	30y: 29%	Alder > 30y - HR **3.8** (CI3.0-4.6) Alder > 40y - HR **4.3** (CI3.7-4.9)	PROM, artrose, halten, positiv impingement test, postoperativ anterior overcoverage	Seroius
Wells et al. (2017)	121	27y (10-45)	18y (14-22)	18y: 74%	Alder > 25y OR **8.9** (CI2.6-31)	artrose, ledkongrurens	Moderate
Clohisy et al. (2017)	391	25y (10-53)	2.6y (2-5)	2.6y: 99%	Hvert år ældre patienten bliver forbedres smerte scoren i HOOS med **0.29** points (CI0.2-0.6)	Alder, køn, BMI, ipsilateral kirurgi, hospital	Moderate
Grammatopoulos et al. (2016)	68	25y (15-41)	8y (2-18)	10y: 93%	Alder < 30y vs. alder > 30y, p=0.9		Moderate

Bilag 4 - SoF tabel							
Albers et al. (2013)	165	28y (12-55)	11y (10-14)	Gruppe 1:10y90% Gruppe 2:10y78%	Alder > 30y - HR **4.1** (CI3.3-4.9)	PROM, artrose, halten, ledkongrurens, over- og undercoverage, retroversion, manglende offset korrektion ved inkongrurente led	Low-Moderate
Hartig-Andreasen et al. (2012)	401	34y (13-62)	8y (4-12)	12y: 75%	Alder > 40y - HR **2.1** (CI1.3-3.4)	Køn, præ- og postoperativ CE vinkel, artrose	Low-Moderate
Ito et al. (2011)	158	42y (12-56)	11y (8-20)	11y: 96%	Alder > 40y - Konversion til THA p=0.38, Lavere PROM p=0.02,		Seroius
Troelsen et al. (2009)	116	30y (14-57)	7y (5-9)	9y: 82%	Alder > 45y - HR 2.3 (CI0.8-6.8) p=0.13	Artrose	Moderate
Matheney et al. (2009)	135	27y (10-45)	9y (2SD)	10y: 84%	Alder > 35y - OR 6.5 (CI2.0-20)	ledkongrurens	Moderate
Steppacher et al. (2008)	75	29y (13-56)	20y (19-23)	20y: 61%	Alder stiger med et år = HR 1.08 (CI1.04-1.11)	PROM, artrose, extrusion index (efter operationen), positiv impingement test.	Low

PROM (Merle d'aubaine and Postel, HHS, WOMAC, HOOS), HR (Hazard Ratio), OR (Odds ratio), THA (kunstig hofte),

Høringssvar angående Klinisk retningslinje vedr.:

Høringssvar 1.
Jens Lauritsen
Der mangler præcis angivelse af diagnosekoder og relevante behandlingskoder.
Er en så fast aldersgrænse som 45 år helt relevant?

Høringssvar 2
Søren Overgaard og Nicolaj Winther

Spørgsmålet er, hvilken anbefaling som litteraturen støtter.

Jeres overvejelser er som følger nedenfor, og giver ikke hos mig, nogen solid støtte for at konkludere det ene frem for det andet ift ja eller nej.

Sakset fra dokumentet:
På baggrund af den tilgængelige litteratur kan man konstatere at konversions raten til THA stiger med alderen. Det vil sige at jo aldre man er, nar man modtager en PAO-operation jo kortere tid går der i gennemsnit for man modtager en kunstig hofte. I de foreliggende observationelle studier har der vares confoundere relateret til alder, specielt i form af sekundær artrose. Der tegner sig ikke noget klart billede, men flere studier har dog påpeget at hazard ratio ved stigende alder, falder når der justeres for kendte risikofaktorer som f.eks. artrose, kongrurens, tidligere kirurgi mm.
På grund af sparsom evidens i den tilgængelige litteratur er det ikke muligt at konkludere om patienter aldre end 45 år har et ligeså god klinisk outcome af PAO, som patienter yngre end 45 år. Der er dog studier der viser en forbedret PROM ved den aldre kategori samt en større forbedring i PROM forhold til yngre patienter.
Det er heller ikke muligt entydigt at vurdere om komplikationsraten er hojere for patienter aldre en 45 år end for patienter yngre end 45 år. Der er studier der viser en øget risiko for alvorlig komplikation pa per- og postoperativt efter en PAO.

Vi ved udmærket at der er flere ældre der konverteres til THA af flere årsager hvoraf en af dem er at vores tærskel til THA er lavere hos ældre end unge.
Men at måske 75% lever med der egen hofte, fremfor en THA, synes jeg er ganske fint.

Man kan derfor overveje:

1) Anbefaling:
Med svag underliggende dokumentation anbefales at overveje PAO operation på personer over 45 år, uden artrose eller overvægt og med god bevægelse af hofte

2) God klinisk praksis:
Det er god klinisk praksis at foretage præoperativt MR-scanning med brusk sekvenser. Findes brusken normal og er hofteleddet uden sekundære artrose tegn kan PAO tilbydes

Man skal være klar over at en anbefaling bliver et juridisk dokument.

En detalje er at der i jeres ROBINS I tool står 50 år:

ROBINS-I tool (Stage I): At protocol stage
Specify the review question
Participants Ole Ovesen, Stig Storgaard Jakobsen

Experimental intervention Periacatabular osteotomi over 50 år.
Comparator Operation med periacetabular osteotomi under 50 år.

Ovenstående høringssvar er diskuteret i forfattergruppen. I den oprindelige version har vi ændret slettet følgende/ tilføjet følgende/ ændret følgende.

A.

1. Kort klinisk retningslinje vedr.: Periacetabularosteomi (PAO) for patienter over 45 år med symptomatisk hoftedysplasi.

Anbefaling:

↑ Med svag underliggende dokumentation anbefales at overveje PAO operation på personer over 45 år, uden artrose eller overvægt og med god bevægelse af hoften (+)( )( )( ).

Anbefalingens styrke er svag og derfor er det arbejdsgruppens opfattelse god klinisk praksis er at kirurgen i det enkelte tilfælde præoperativt grundigt må vurdere om der er konkurrerende risici; artrose (JWS<3mm), overvægt, nedsat bevægelighed samt anden komorbiditet.

I stedet for:

Anbefaling:

↑ Med svag underliggende dokumentation anbefales at overveje at undlade PAO operation på personer over 45 år (+)( )( )( ).

Anbefalingens styrke er svag og derfor er det arbejdsgruppens opfattelse at kirurgen i det enkelte tilfælde præoperativt grundigt må vurdere om der er konkurrerende risici; artrose (JWS<3mm), overvægt, nedsat bevægelighed samt anden komorbiditet.

B.

7. Anbefaling:

Følgende symboler, indikerer styrken af anbefalingerne: ↑↑ = Stærk anbefaling for
↑ = Svag/betinget anbefaling for
↓ = Svag/betinget anbefaling imod

↓↓ = Stærk anbefaling imod

√ God praksis. Anvendes hvor der ikke findes evidens på området, men hvor arbejdsgruppen ønsker at fremhæve særlige aspekter af anerkendt klinisk praksis.

Følgende symboler angiver evidensniveau: (+)(+)(+)(+) = Høj
(+)(+)(+) = Moderat
(+)(+) = Lav

(+) = Meget Lav

↑ Med svag underliggende dokumentation anbefales at overveje PAO operation på personer over 45 år (+)( )( )( ).

Anbefalingens styrke er svag og det er derfor arbejdsgruppens opfattelse at kirurgen i det enkelte tilfælde præoperativt grundigt må vurdere konkurrerende risici. Såfremt der ikke er sekundær artrose (evt. vurderet med supplerende billeddiagnostik), overvægt og patienten i øvrigt ikke har anden betydende komorbiditet kan man med et godt resultat udføre PAO på patienter ældre en 45 år.

I stedet for:

7. Anbefaling:

Følgende symboler, indikerer styrken af anbefalingerne: ↑↑ = Stærk anbefaling for
↑ = Svag/betinget anbefaling for
↓ = Svag/betinget anbefaling imod

↓↓ = Stærk anbefaling imod

√ God praksis. Anvendes hvor der ikke findes evidens på området, men hvor arbejdsgruppen ønsker at fremhæve særlige aspekter af anerkendt klinisk praksis.

Følgende symboler angiver evidensniveau: (+)(+)(+)(+) = Høj
(+)(+)(+) = Moderat
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(+) = Meget Lav

↑ Med svag underliggende dokumentation anbefales at overveje at undlade PAO operation på personer over 45 år (+)( )( )( ).

Anbefalingens styrke er svag og det er derfor arbejdsgruppens opfattelse at kirurgen i det enkelte tilfælde præoperativt grundigt må vurdere konkurrerende risici. Såfremt der ikke er sekundær artrose (evt. vurderet med supplerende billeddiagnostik), overvægt og patienten i øvrigt ikke har anden betydende komorbiditet frarådes det ikke at foretage PAO på patienter ældre en 45 år.

C.

Endelig er alderen ændret fra 50 år til 45 i Bilag 3.

Med Venlig Hilsen

Forfattergruppen