



Wylde, V., Kunutsor, S. K., Lenguerrand, E., Jackson, J., Blom, A. W., & Beswick, A. D. (2019). Association of social support with patient-reported outcomes after joint replacement: A systematic review and meta-analysis. *The Lancet Rheumatology*, 1(3), e174-e186.
[https://doi.org/10.1016/S2665-9913\(19\)30050-5](https://doi.org/10.1016/S2665-9913(19)30050-5)

Peer reviewed version

Link to published version (if available):
[10.1016/S2665-9913\(19\)30050-5](https://doi.org/10.1016/S2665-9913(19)30050-5)

[Link to publication record in Explore Bristol Research](#)
PDF-document

This is the author accepted manuscript (AAM). The final published version (version of record) is available online via Elsevier at <https://www.sciencedirect.com/science/article/pii/S2665991319300505>. Please refer to any applicable terms of use of the publisher.

University of Bristol - Explore Bristol Research

General rights

This document is made available in accordance with publisher policies. Please cite only the published version using the reference above. Full terms of use are available:
<http://www.bristol.ac.uk/red/research-policy/pure/user-guides/ebr-terms/>

Is social support associated with patient-reported outcomes after joint replacement? A systematic review and meta-analysis

Wylde Vikki PhD^{1,2}, Kunutsor Setor K. PhD^{1,2}, Lenguerrand Erik PhD¹, Jackson John MBBCh³, Blom Ashley W. FRCS, Full Professor^{1,2}, Beswick Andrew D. BSc¹

¹Musculoskeletal Research Unit, Translational Health Sciences, Bristol Medical School, University of Bristol, UK

²National Institute for Health Research Bristol Biomedical Research Centre, University Hospitals Bristol NHS Foundation Trust and University of Bristol, UK

³Histopathology Department, Royal Devon and Exeter Hospital, Exeter, UK

Correspondence to:

Dr Vikki Wylde, Musculoskeletal Research Unit, University of Bristol, Learning and Research Building, Southmead Hospital, Bristol, BS10 5NB

v.wylde@bristol.ac.uk

SUMMARY

Background

Identifying prognostic factors for outcomes after joint replacement could improve the provision of stratified care. This study evaluated whether social support is a prognostic factor for better patient-reported outcomes after total hip replacement (THR) and total knee replacement (TKR).

Methods

In this systematic review, MEDLINE, Embase and PsycINFO were searched from inception to April 2019. Cohort studies evaluating the association between social support and patient-reported outcomes at three months or longer after THR or TKR were included. Outcomes included pain, function, satisfaction and general health. Data were extracted from study reports. Study quality was assessed using the QUIPS tool. Data were synthesized using meta-analysis and narrative synthesis. The review was registered on PROSPERO (CRD42016041485).

Findings

Searches identified 5,810 articles and 56 studies with data from 119,165 patients were included. In meta-analysis, the presence of social support had a beneficial effect on long-term post-operative WOMAC (2,022 patients; mean difference 2.88; 95% CIs 1.30; 4.46) and Oxford Knee Score (69,570 patients; 0.29; 0.12, 0.45). Social support measured using a validated questionnaire was found to be associated with WOMAC pain (671 patients; 0.04; 0.00, 0.08) but not WOMAC function (671 patients; -0.01; -0.12, 0.11). The presence of social support had a positive association with some SF-36 subscales but not others. For all outcomes, results of narrative synthesis were inconsistent.

Interpretation

There is evidence that social support is a prognostic factor for some outcomes after joint replacement. Development and evaluation of complex interventions to improve social support and social integration is warranted.

Funding

This study was supported by the NIHR Biomedical Research Centre at University Hospitals Bristol NHS Foundation Trust and the University of Bristol.

PANEL: RESEARCH IN CONTEXT

Evidence before this study

We did a thorough search of the scientific literature and PROSPERO before initiating this study to identify any existing or planned systematic reviews. Previous systematic reviews provided a broad overview of prognostic factors for outcomes after hip and knee replacement, but no existing or planned reviews focussed on social support.

Added value of this study

Our study is the first to use a comprehensive search strategy to identify relevant studies and conduct meta-analysis to quantify the effect of social support on patient-reported outcomes after hip and knee replacement.

Implications of all the available evidence

The finding that social support is a prognostic factor for some joint-specific and general health outcomes after hip and knee replacement highlights that the development and evaluation of interventions to improve social support and integration in this patient population is warranted.

BACKGROUND

Approximately 200,000 total hip replacements (THRs) and total knee replacements (TKR) are performed annually in the National Health Service (NHS) ^{1,2}, and the need for this procedure has been predicted to increase ³. Although the surgery is successful for many patients, 10-30% of patients experience long-term pain and functional limitations after surgery ^{4,5}. To optimise outcomes, there has been increasing interest in identifying prognostic factors for a poor outcome after joint replacement ⁶⁻¹⁰. Identification of prognostic factors could facilitate the provision of stratified care and optimise outcomes. With the increasing volume of research on this topic, comprehensive systematic reviews are needed to summarise the existing literature.

Social isolation and loneliness are prevalent among patients undergoing joint replacement ¹¹. Social support is defined as a social network's provision of psychological and material resources ¹² and has been shown to have a protective effect on general health ¹³. However, the effect of social support on outcomes after joint replacement is unclear. The influence of social support has been considered previously within systematic reviews that evaluated numerous risk factors for outcomes after joint replacement ^{6,9,10,14}. Due to the broad scope of these reviews, only a small number of studies which assessed social support were included and the conclusions from these reviews have been conflicting. The aim of this systematic review was to synthesise longitudinal research evaluating whether social support is a prognostic factor for patient-reported outcomes after primary THR and TKR.

METHODS

The systematic review and meta-analysis was registered on PROSPERO, the international prospective register of systematic reviews (CRD42016041485). The review was registered as a larger project evaluating the impact of social support on different outcomes after joint replacement; other outcomes will be reported separately. Methods used follow guidance on systematic reviews of prognostic factor studies ¹⁵ and reporting follows guidance for meta-analysis of observational studies in epidemiology (MOOSE) ¹⁶, with a checklist provided in Appendix 1.

Selection criteria

Studies were eligible if they met the following criteria ¹⁵:

Population: Adults undergoing primary TKR or THR. Studies that also included patients undergoing other procedures were included if separate results were available for THR or TKR patients.

Index prognostic factor: Measurement of social support

Comparator prognostic factors: Unadjusted and adjusted prognostic effect of social support were considered. For the adjusted prognostic effect, pre-operative pain/function was considered particularly relevant¹⁰.

Outcome: Patient-reported outcome measure (PROMs) assessing pain, function, satisfaction or general health. Studies that used surgeon-administered tools, such as the American Knee Society Score or Harris Hip Score, were excluded because of the discrepancies between patients' and clinicians assessment of outcomes ¹⁷.

Timing: Social support assessed pre-operative or within the first six weeks of surgery and outcome at three months or longer post-operative.

Setting: Secondary care

Literature searches

MEDLINE, Embase and PsychINFO on the Ovid SP platform were searched from inception to 5th April 2019. Searches were conducted by an experienced systematic reviewer (ADB) and included terms to capture the concept of social support (Appendix 2). No language restrictions were applied and relevant non-English articles were translated and included. Searches were supplemented by tracking key articles in Institute for Scientific Information (ISI) Web of Science and handsearching of reference lists of systematic reviews . Conference abstracts and theses were excluded.

Screening

Bibliographic details of the articles identified in searches were exported and managed in an EndNote database. After removal of duplicates, an initial screening of titles and abstracts was performed by one reviewer (ADB) to remove clearly off-topic studies. The remaining titles and abstracts were then screened in duplicate by two reviewers (VW and ADB) and reasons for exclusion recorded. Full-texts of potentially relevant articles were acquired and assessed for eligibility in duplicate by two reviewers (VW and ADB), with disagreements resolved through discussion with a third reviewer. Author contact was planned to resolve any queries regarding eligibility but was not required.

Data extraction

Data from eligible articles were extracted into Microsoft Excel by one reviewer (VW) with checking against source articles by a second reviewer (ADB). Extracted data comprised: country, date, setting, population, participant demographics, assessments of social support and outcomes, statistical analyses and study quality. Authors of studies that were eligible for inclusion in meta-analysis but did not fully report results were contacted and data requested.

Study quality assessment

Study quality was assessed using the Quality in Prognostic Studies (QUIPS) tool¹⁸. Study quality was rated as high, moderate or low risk of bias for study participation; attrition; prognostic factor measurement; outcome measurement; confounding; and statistical analysis and reporting. Study rating was performed by one reviewer (VW) and checked by a second (EL); any discrepancies were resolved through discussion.

Data synthesis

Two or more studies were eligible for pooled analysis if they assessed outcomes at between 6-12 months post-operative with a validated tool and conducted multivariable analysis with adjustment for pre-operative pain/function. Summary measures were presented as mean differences. For data reported as medians, ranges, and 95% confidence intervals (CIs), means and standard deviations were calculated¹⁹. When reported estimates could not be

transformed, relevant data was obtained through correspondence with study authors. Given the heterogeneous assessment of social support (e.g. marital status, living arrangements, assistance during recovery) and the limited number of studies available for pooling, binary social support exposures were re-categorised to “social support present/absent” to enable a consistent approach to meta-analysis and enhance interpretation of findings. Continuous social support exposures were not re-catergorised. Differences in the direction of outcome scales were corrected for using standard methods²⁰. Random-effects models, which take into account heterogeneity within and between studies, were used to combine mean differences²¹ (parallel analyses used fixed-effect models). Heterogeneity across studies was assessed using the Cochrane χ^2 statistic and the I^2 statistic²². We planned to conduct sensitivity analyses and exclude studies from meta-analysis which were at moderate-high risk of bias on ≥ 2 domains, or at moderate-high risk of bias for prognostic factor measurement. However, at analysis stage, no studies met the criteria for exclusion from meta-analysis. For studies reporting outcomes separately for THR and TKR patients, we conducted stratified analyses and random effects meta-regression²³. Formal tests of publication bias²⁴ were not performed as they have low power and are unreliable in pooled analysis involving >10 studies²⁰. A narrative synthesis was performed for studies that could not be pooled. STATA release 15 (Stata Corp, College Station, Texas, USA) was used for statistical analyses.

Role of funding source

The study funder had no role in study design; data collection, analysis or interpretation; or writing of the report. The corresponding author had full access to all the data and had final responsibility for the decision to submit for publication.

RESULTS

An overview of the review process is provided in Figure 1. Searches identified 5,810 articles; 5,028 articles were discarded after reviewing the titles and abstracts as they clearly did not meet the eligibility criteria and 786 articles were considered potentially relevant. After full-text screening, 55 met the selection criteria²⁵⁻⁷⁹. A further study was picked up from handsearching reference lists⁸⁰, and three studies from ISI tracking⁸¹⁻⁸³. Five cohorts were reported in more than one article; three of these are combined in the results and two are

reported separately (further details in Appendix 3). Therefore, the results of 56 studies with 119,165 patients (median 258, range 35-66,769) are reported. Data for two studies^{62,72} were provided by authors. An overview of studies is provided in Appendix 4 and individual study characteristics are summarised in Table 1 (further details in Appendix 3). Details of study quality are provided in Table 2. The domain most commonly rated as moderate or high risk of bias was study participation (n=37), followed by attrition (n=16) and statistical analysis and reporting (n=15).

The association between the presence/absence of social support and joint-specific outcomes was assessed in 25 studies. Nine studies were included in meta-analysis, with two studies at high risk of bias on one domain of study quality. Results are provided in Figure 2 for the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and Figure 3 for the Oxford Knee Score (OKS). In pooled analysis of two studies with 2,022 participants the presence of social support was found to have a beneficial effect on WOMAC total scores (mean difference 2.88; 95% CIs 1.30; 4.46). Similarly, pooled analysis of four studies with 69,570 participants found social support was positively associated with OKS total scores (0.29; 0.12, 0.45). The effect on subscale scores was less consistent: the presence of social support had a beneficial effect on the OKS pain subscale (0.58; 0.09, 1.07) but there was no evidence of an effect on WOMAC function (2.60; -0.75, 5.95), WOMAC pain (0.51; -0.04, 1.05) or OKS function (0.15; -0.24, 0.55). Pooled analysis stratified by replaced joint suggested a slightly larger effect of social support on WOMAC pain and function after TKR compared with THR (Appendix 5). Results from the narrative synthesis were mixed. Eight studies, four of which were at high risk of bias on ≥ 1 domain, reported a positive association between the presence of social support and outcomes, including the WOMAC^{29,43,46,63,65,71,76} and pain Visual Analogue Scale⁴¹. A lack of positive association was reported in 14 studies; six of these studies were at high risk of bias on ≥ 1 domain. Nine studies found a lack of association between presence of social support and WOMAC at between six months and seven years post-operative^{29,43,46,47,59,63,65,74,75}. Other outcomes that were not associated with social support included the Hip disability and Osteoarthritis outcome Score (HOOS)/ Knee disability and Osteoarthritis outcome Score (KOOS)³⁷, Oxford Hip Score⁷⁹, and satisfaction^{41,66}. In one study, patients who lived alone reported greater improvement in WOMAC function⁶⁰, however this study was at high risk of bias on four domains. The two studies included in narrative synthesis that were at low risk of bias for all domains found that the

presence of social support was associated with better WOMAC function at 6 months after THR ⁴⁶ but not TKR ^{46,47}.

The association between social support assessed using a PROM and joint-specific outcomes was assessed in 12 studies, and two studies with 671 participants were included in meta-analysis (Figure 2); neither study was at high risk of bias. In pooled analysis, there was evidence that social support measured using the Medical Outcomes Study Social Support Survey was weakly associated with WOMAC pain (0.04; 0.00, 0.08). No association was found with WOMAC function (-0.01; -0.12, 0.11), although there was evidence of substantial heterogeneity between contributing studies in this analysis. Results from the studies included in the narrative synthesis were again inconsistent. Six studies (two at high risk of bias on ≥ 1 domain) found a positive association between a measured aspect of social support and WOMAC total or subscale scores at follow-up. Social support measures included the Social Provisions Scale ²⁸, Fragebogen zur sozialen Unterstützung ⁵¹, Medical Outcomes Study ^{52,80}, DUKE social support scale ⁶⁷, and unvalidated measures of spousal pressure and persuasion ⁷⁰. Most of these studies also reported no association between other aspects of social support and outcome ^{28,51,52,67,80}. No association was also found in four other studies, two of which were at high risk of bias on two domains. These studies evaluated associations between the Groningen Orthopaedic Social Support Scale and WOMAC ⁷³, unvalidated measures of support social and WOMAC ^{49,82}; and the SF-36 social functioning domain and satisfaction ³⁸. Only one study included in the narrative synthesis was at low risk of bias on all domains; this study found that better scores on one subscale of the Social Provisions Scale (the reliable alliance subscale) was associated with better WOMAC total score at 3 months after THR ²⁸.

The association between the presence/absence of social support and general health outcomes was assessed in 28 studies, and three studies with 2,515 participants were included in meta-analysis (Figure 4). One study included in meta-analysis was at high risk of bias for one domain. In meta-analysis, the presence of social support was found to have a beneficial effect on SF-36 total scores (2.78; 0.45, 5.11), and the subscales of role physical (17.45; 7.24, 27.66), social function (6.46; 0.62, 12.30), role emotional (12.83; 3.61, 22.05), mental health (6.46; 1.40, 11.52), general health (4.53; 0.55, 8.51) but there was no evidence of an effect on bodily pain (5.88; -0.31, 12.06), physical function (4.28; -1.42, 9.98) or vitality (0.75; -4.60, 6.10). Results from the narrative synthesis were inconsistent. Twenty-one studies reported no positive association between the presence of social support and general health outcomes; 14 of these studies were at high risk of bias on ≥ 1 domain. Outcomes assessed included SF-36 or

SF-12 total or subscale scores ^{26,31,37,45,47,48,53,56,58,59,63,69}, Nottingham Health Profile ⁴⁰, EQ-5D ^{41,43,50,74}, Instrumental Activity of Daily Living ⁴², Indicators of the Rehabilitation Status questionnaire (IRES) pain subscale ³⁵, and Yale Physical Activity Score ³³. One study reported that being unmarried was associated with better self-care and transfer on the Functional Independence Measure but not locomotion ²⁷ and another study found that a lack of family support was associated with better SF-36 Mental Component scores at 3 months ⁵⁶. Eight studies (four at high risk of bias on ≥ 1 domain) reported a positive association between the presence of social support and general health outcomes measured using the SF-36 or SF-12 total or subscale scores ^{36,56,58,63,71,76}, IRES questionnaire mobility subscale ³⁵, and World Health Organization Quality of Life-100 ⁷⁸. Three studies in the narrative synthesis were at low risk of bias on all domains; two studies found social support was not associated with SF-36 scores at 6 months after TKR ^{31,47} and one study found that the absence of social support was associated with poorer mobility but not pain at 6 months after THR or TKR ³⁵. The association between social support assessed using a PROM and general health outcomes was assessed in four studies, with two at high risk of bias on ≥ 1 domain. Pooled analysis of these studies was not appropriate due to heterogeneity in the PROMs used to assess social support, and therefore narrative synthesis was undertaken. Three studies found that social support was not associated with SF-36 outcomes; PROMs used to assess social support included the ENRICH Social support instrument ⁵⁵, SF-36 social functioning subscale ⁶⁸ and Groningen Orthopaedic Social Support Scale ⁷³. One study found that lower social support, measured with the DUKE social support scale, was associated with worse SF-36 physical function, physical role, vitality, emotional role and mental health but not bodily pain, social role, emotional role ⁶⁷. The one study at low risk of bias on all domains found that social support was not associated with SF-36 scores at 6 or 12 months after THR ⁵⁵.

DISCUSSION

This article reports the findings from the most comprehensive systematic review and meta-analysis to date which has evaluated whether social support is a prognostic factor for patient-reported outcomes at three months or longer after primary THR and TKR. Results from the meta-analyses provide evidence that social support is a prognostic factor for some joint-specific and general health outcomes. Although the findings are promising, they should be interpreted with caveats; the measurement of social support was rudimentary in most studies,

the effects were small and findings from studies included in narrative synthesis were inconsistent. Despite this, this systematic review suggests that interventions to improve social support and integration for patients undergoing joint replacement warrant further exploration to determine if they could lead to clinically important improvements in outcomes.

It is important to acknowledge the limitations of this review when interpreting the results. Although a comprehensive search strategy was used, four studies were found that were not identified in initial searches, highlighting the difficulty in identifying relevant studies. Nevertheless, while it is acknowledged that some relevant studies may have been omitted, the tailored search strategy and in-depth focus on one prognostic factor facilitated the identification and inclusion of a greater volume of relevant literature than previous reviews, which have included fewer than five studies which assessed social support^{6,9,10,14}. Also conference abstracts and other grey literature were not included in the review, which may have introduced publication bias⁸⁴. Another limitation relates to the methodological quality of the included studies. The most common methodological issue, affecting two thirds of included studies, was study participation. This was predominately related to studies recruiting from a single centre, which may have limited the generalisability of findings due to a selected or homogeneous population. Another methodological issue was the assessment of social support. The multidimensional nature of social support as a construct was not captured in most studies, which primarily focussed on the presence or absence of informal social support from family through assessment of marital status or living arrangements. This simplistic measure does not fully encapsulate the concept of social support or provide an indication of the quality of the different facets of support, including instrumental (provision of material aid), informational or emotional support¹². A number of social support PROMS have been developed to allow a more comprehensive assessment, although only a minority of studies included in the review used such measures. Pooled analyses for the majority of outcomes were based on limited number of studies and some of the findings were also based on single reports, hence need replication in further studies.

Broader systematic reviews of prognostic factors for outcomes after joint replacement have drawn differing conclusions on the association between social support and patient-reported outcomes^{6,9,10,14}. The main contributing factor to these discrepancies is likely to be the small number of studies identified and included in these reviews. Our review suggested that social support can exert a beneficial effect on patient-reported outcomes, reflecting that recovery from joint replacement takes place in a social context. There are numerous potential

mechanisms by which social support could influence outcomes, such as by reducing loneliness, providing psychological support, increasing ability to cope with stress, providing material resources to aid recovery, and increasing self-efficacy and confidence in resuming activities and mobilising after surgery^{12,85-87}. Qualitative research has found that during the early recovery phase after orthopaedic surgery, family members are essential for providing informal care and supporting rehabilitation. Help from family members is required for most activities of daily living, including dressing, cooking, and bathing^{88,89}. The presence of a trusted other can give patients more confidence to mobilise and become independent, through alleviating some of the fears associated with mobilisation, such as falls and accidents⁹⁰.

This review has highlighted the need for future studies to use validated PROMs to measure the quality of the different facets of social support to understand the relative contributions of instrumental, informational and emotional support to improving outcomes after surgery. The methodological quality of future studies could also be improved to generate higher quality evidence about prognostic factors, for example by conducting multicentre studies which implement strategies to minimise loss to follow-up. To inform changes to clinical care, studies are needed to evaluate interventions aimed at reducing social isolation and improving social participation. Social isolation is an issue for older people in general and identifying and overcoming barriers to social participation could improve physical and mental well-being⁹¹. Many studies included in this review assessed structural measures of social support e.g. marital status which are not amenable to modification; however, there are aspects of social support that could be targeted within clinical contexts. For example, in the context of orthopaedic surgery, patients often find group-based rehabilitation or information sessions positive as they offer the opportunity to meet people at a similar stage of recovery^{92,93}, suggesting that evaluation of peer-support activities and group interventions as a method of widening social networks is warranted. Another approach is to optimise the support provided by family members. Patients often prefer a communal approach to coping with chronic illness and ill health⁸⁶ and integrating significant others in the experience of joint replacement could improve the informational and emotional support available to patients. For example in osteoarthritis, an intervention that involved spouses in pain coping skills training was found to improve the health of patients⁸⁷. Different interventions would be needed for patients who live alone, and optimisation of social care provision could lead to cost saving as living alone after joint replacement has been estimated to cost the NHS an additional £4.9 million per year due to longer length of stay and increased rate of hospital readmission⁹⁴.

In conclusion, this review found evidence that social support is a prognostic factor for some joint-specific and general health outcomes after THR and TKR. This suggests that the evaluation of interventions to improve modifiable aspects of social support and integration is warranted. There is complexity in developing such interventions because of the need for tailoring to individual needs and involvement of different organisational levels, such as community initiatives, health care, and social care, and therefore robust intervention development work is needed to inform the design of future interventions.

FIGURE LEGENDS

Figure 1: PRISMA flow chart

Figure 2: Meta-analysis of the association between social support (measured as present/absent or using a patient-reported outcome measure) and WOMAC outcomes

Figure 3: Meta-analysis of the association between social support (measured as present/absent) and Oxford Knee Score outcomes

Figure 4: Meta-analysis of the association between social support (measured as present/absent) and SF-36 outcomes

FUNDING

This study was supported by the NIHR Biomedical Research Centre at University Hospitals Bristol NHS Foundation Trust and the University of Bristol. The views expressed in this publication are those of the authors and not necessarily those of the NHS, the National Institute for Health Research or the Department of Health and Social Care.

AUTHOR CONTRIBUTIONS

ADB, EL, AWB and VW conceived and designed the review; VW, ADB and JJ screened studies; VW and ADB extracted data; VW and EL rated study quality; SK conducted meta-analysis; VW conducted narrative synthesis; VW drafted the manuscript; all authors revised the manuscript for important intellectual content.

DECLARATION OF INTERESTS

None of the authors declare any competing interest with the submitted work. Outside of the submitted work, VW and AWB receive institutional research funding from Stryker.

ACKNOWLEDGEMENTS

The authors would like to acknowledge Yong Hao Pua, Marita Cross, Kate Tribe and Lyn March for providing data that was included in this review.

ETHICS COMMITTEE APPROVAL

Not applicable

References

1. National Joint Registry. 15th Annual Report for England, Wales, Northern Ireland and the Isle of Man. Hemel Hempstead: NJR centre; 2018.
2. Scottish Arthroplasty Project. Biennial report NHS National Services Scotland; 2018.
3. Culliford D, Maskell J, Judge A, et al. Future projections of total hip and knee arthroplasty in the UK: results from the UK Clinical Practice Research Datalink. *Osteoarthritis Cartilage* 2015; **23**(4): 594-600.
4. Beswick AD, Wylde V, Gooberman-Hill R, Blom A, Dieppe P. What proportion of patients report long-term pain after total hip or knee replacement for osteoarthritis? A systematic review of prospective studies in unselected patients. *BMJ Open* 2012; **2**(1): e000435.
5. Maxwell JL, Felson DT, Niu J, et al. Does clinically important change in function after knee replacement guarantee good absolute function? The multicenter osteoarthritis study. *J Rheumatol* 2014; **41**(1): 60-4.
6. Bletterman AN, de Geest-Vrolijk ME, Vriezekolk JE, Nijhuis-van der Sanden MW, van Meeteren NL, Hoogeboom TJ. Preoperative psychosocial factors predicting patient's functional recovery after total knee or total hip arthroplasty: a systematic review. *Clin Rehabil* 2018; **32**(4): 512-25.
7. Hofstede SN, Gademan MGJ, Stijnen T, Nelissen R, Marang-van de Mheen PJ, Argon-Optima study group. The influence of preoperative determinants on quality of life, functioning and pain after total knee and hip replacement: a pooled analysis of Dutch cohorts. *BMC Musculoskelet Disord* 2018; **19**(1): 68.
8. Wylde V, Beswick AD, Dennis J, Gooberman-Hill R. Post-operative patient-related risk factors for chronic pain after total knee replacement: a systematic review. *BMJ Open* 2017; **7**(11).
9. Harmelink KEM, Zeegers A, Hullegie W, Hoogeboom TJ, Nijhuis-van der Sanden MWG, Staal JB. Are There Prognostic Factors for One-Year Outcome After Total Knee Arthroplasty? A Systematic Review. *J Arthroplasty* 2017; **32**(12): 3840-53.e1.
10. Lewis GN, Rice DA, McNair PJ, Kluger M. Predictors of persistent pain after total knee arthroplasty: a systematic review and meta-analysis. *Br J Anaesth* 2015; **114**(4): 551-61.
11. Smith TO, Dainty JR, MacGregor AJ. Changes in social isolation and loneliness following total hip and knee arthroplasty: longitudinal analysis of the English Longitudinal Study of Ageing (ELSA) cohort. *Osteoarthritis Cartilage* 2017; **25**(9): 1414-9.
12. Cohen S. Social relationships and health. *Am Psychol* 2004; **59**(8): 676-84.
13. Reblin M, Uchino BN. Social and emotional support and its implication for health. *Curr Opin Psychiatry* 2008; **21**(2): 201-5.
14. Hofstede SN, Gademan MG, Vliet Vlieland TP, Nelissen RG, Marang-van de Mheen PJ. Preoperative predictors for outcomes after total hip replacement in patients with osteoarthritis: a systematic review. *BMC Musculoskelet Disord* 2016; **17**: 212.
15. Riley RD, Moons KGM, Snell KIE, et al. A guide to systematic review and meta-analysis of prognostic factor studies. *BMJ* 2019; **364**: k4597.
16. Stroup DF, Berlin JA, Morton SC, et al. Meta-analysis of observational studies in epidemiology: a proposal for reporting. Meta-analysis Of Observational Studies in Epidemiology (MOOSE) group. *JAMA* 2000; **283**(15): 2008-12.
17. Hewlett SA. Patients and clinicians have different perspectives on outcomes in arthritis. *J Rheumatol* 2003; **30**(4): 877-9.
18. Hayden JA, van der Windt DA, Cartwright JL, Cote P, Bombardier C. Assessing bias in studies of prognostic factors. *Ann Intern Med* 2013; **158**(4): 280-6.

19. Hozo SP, Djulbegovic B, Hozo I. Estimating the mean and variance from the median, range, and the size of a sample. *BMC Med Res Methodol* 2005; **5**: 13.
20. Higgins J, Green SE. Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0 [updated March 2011]. The Cochrane Collaboration, 2011. Available from <http://handbook-5-1.cochrane.org/>. Last accessed 19th August 2019.
21. DerSimonian R, Laird N. Meta-analysis in clinical trials. *Control Clin Trials* 1986; **7**(3): 177-88.
22. Higgins JP, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta-analyses. *BMJ* 2003; **327**(7414): 557-60.
23. Thompson SG, Sharp SJ. Explaining heterogeneity in meta-analysis: a comparison of methods. *Stat Med* 1999; **18**(20): 2693-708.
24. Sterne JA, Sutton AJ, Ioannidis JP, et al. Recommendations for examining and interpreting funnel plot asymmetry in meta-analyses of randomised controlled trials. *BMJ* 2011; **343**: d4002.
25. Amusat N, Beaupre L, Jhangri GS, et al. Diabetes that impacts on routine activities predicts slower recovery after total knee arthroplasty: an observational study. *J Physiother* 2014; **60**(4): 217-23.
26. Badura-Brzoza K, Zajac P, Kasperska-Zajac A, et al. Anxiety and depression and their influence on the quality of life after total hip replacement: Preliminary report. *Int J Psychiatry Clin Pract* 2008; **12**(4): 280-4.
27. Bindawas SM, Graham JE, Karmarkar AM, et al. Trajectories in functional recovery for patients receiving inpatient rehabilitation for unilateral hip or knee replacement. *Arch Gerontol Geriatr* 2014; **58**(3): 344-9.
28. Brembo EA, Kapstad H, Van Dulmen S, Eide H. Role of self-efficacy and social support in short-term recovery after total hip replacement: a prospective cohort study. *Health Qual Life Outcomes* 2017; **15**(1): 68.
29. Chesworth BM, Nizar N, Bourne RB, Davis AM, Ojrr Study Group. Willingness to go through surgery again validated the WOMAC clinically important difference from THR/TKR surgery. *J Clin Epidemiol* 2008; **61**(9): 907-18.
30. Dailiana ZH, Papakostidou I, Varitimidis S et al. Patient-reported quality of life after primary major joint arthroplasty: a prospective comparison of hip and knee arthroplasty. *BMC Musculoskelet Disord* 2015; **16**: 366.
31. Desmeules F, Dionne CE, Belzile EL, Bourbonnais R, Champagne F, Fremont P. Determinants of pain, functional limitations and health-related quality of life six months after total knee arthroplasty: results from a prospective cohort study. *BMC Sports Sci Med Rehab* 2013; **5**: 2.
32. Edwards HB, Smith M, Herrett E, MacGregor A, Blom A, Ben-Shlomo Y. The Effect of Age, Sex, Area Deprivation, and Living Arrangements on Total Knee Replacement Outcomes: A Study Involving the United Kingdom National Joint Registry Dataset. *JB JS Open Access* 2018; **3**(2): e0042.
33. Elman SA, Dong Y, Stenquist DS, et al. Participation in physical activity in patients 1-4 years post total joint replacement in the Dominican Republic. *BMC Musculoskelet Disord* 2014; **15**: 207.
34. Escobar A, Quintana JM, Bilbao A, et al. Effect of patient characteristics on reported outcomes after total knee replacement. *Rheumatology* 2007; **46**(1): 112-9.
35. Farin E, Glattacker M, Jackel, WH. Predictors of rehabilitation outcome in patients after total hip and total knee arthroplasty - A multilevel analysis. [German]. *Physikalische Medizin Rehabilitationsmedizin Kurortmedizin* 2006; **16**(2): 82-91.
36. Fitzgerald JD, Orav EJ, Lee TH, et al. Patient quality of life during the 12 months following joint replacement surgery. *Arthritis Rheum* 2004; **51**(1): 100-9.

37. Fleischman AN, Austin MS, Purtill JJ, Parvizi J, Hozack WJ. Patients living alone can be safely discharged directly home after total joint arthroplasty: A prospective cohort study. *J Bone Joint Surg Am* 2018; **100**(2): 99-106.
38. Gandhi R, Davey JR, Mahomed NN. Predicting patient dissatisfaction following joint replacement surgery. *J Rheumatol* 2008; **35**(12): 2415-8.
39. Gandhi R, Razak F, Davey J, Rampersaud, YR, Mahomed NN. Effect of sex and living arrangement on the timing and outcome of joint replacement surgery. *Can J Surg* 2010; **53**(1): 37-41.
40. Garellick G, Malchau H, Herberts P. Specific or general health outcome measures in the evaluation of total hip replacement. A comparison between the Harris hip score and the Nottingham Health Profile. *Bone Joint Surg Br* 1998; **80**(4): 600-6.
41. Greene ME, Rolfson O, Nemes S, Gordon M, Malchau H, Garellick G. Education attainment is associated with patient-reported outcomes: findings from the Swedish Hip Arthroplasty Register. *Clinical Orthop Relat Res* 2014; **472**(6): 1868-76.
42. Greenfield S, Apolone G, McNeil BJ, Cleary PD. The importance of co-existent disease in the occurrence of postoperative complications and one-year recovery in patients undergoing total hip replacement. Comorbidity and outcomes after hip replacement. *Med Care* 1993; **31**(2): 141-54.
43. Haase E, Kopkow C, Beyer F, et al. Patient-reported outcomes and outcome predictors after primary total hip arthroplasty: results from the Dresden Hip Surgery Registry. *Hip Int* 2016; **26**(1): 73-81.
44. Hopman WM, Mantle M, Towheed TE, MacKenzie TA. Determinants of health-related quality of life following elective total hip replacement. *Am J Med Qual* 1999; **14**(3): 110-6.
45. Ieiri AT, Tushima E, Ishida K, Abe S, Inoue M, Masuda T. What predicts 36-item health survey version 2 after total hip arthroplasty. *Arch Phys Med Rehabil* 2013; **94**(5): 902-9.
46. Jones CA, Voaklander DC, Johnston DW, Suarez-Almazor ME. The effect of age on pain, function, and quality of life after total hip and knee arthroplasty. *Arch Intern Med* 2001; **161**(3): 454-60.
47. Jones CA, Voaklander DC, Suarez-Alma ME. Determinants of function after total knee arthroplasty. *Phys Ther* 2003; **83**(8): 696-706.
48. Keeney BJ, Koenig KM, Paddock NG, Moschetti WE, Sparks MB, Jevsevar DS. Do Aggregate Socioeconomic Status Factors Predict Outcomes for Total Knee Arthroplasty in a Rural Population? *J Arthroplasty* 2017; **32**(12): 3583-90.
49. Khan CM, Iida M, Stephens AP, Fekete EM, Druley JA, Greene KA. Spousal support following knee surgery: roles of self-efficacy and perceived emotional responsiveness. *Rehabil Psychol* 2009; **54**(1): 28-32.
50. Lindberg MF, Rustoen T, Miaskowski C, Rosseland LA, Lerdal A. The relationship between pain with walking and self-rated health 12 months following total knee arthroplasty: a longitudinal study. *BMC Musculoskelet Disord* 2017; **18**(1): 75.
51. Lindner M, Nosseir O, Keller-Pliessnig A, Teigelack P, Teufel M, Tagay S. Psychosocial predictors for outcome after total joint arthroplasty: a prospective comparison of hip and knee arthroplasty. *BMC Musculoskelet Disord* 2018; **19**(1): 159.
52. Lopez-Olivo MA, Landon GC, Siff S J, et al. Psychosocial determinants of outcomes in knee replacement. *An Rheum Dis* 2011; **70**(10): 1775-81.
53. MacWilliam CH, Yood MU, Verner JJ, McCarthy BD, Ward RE. Patient-related risk factors that predict poor outcome after total hip replacement. *Health Serv Res* 1996; **31**(5): 623-38.

54. Mannion AF, Impellizzeri FM, Naal FD, Leunig M. Women demonstrate more pain and worse function before THA but comparable results 12 months after surgery. *Clin Orthop Relat Res* 2015; **473**(12): 3849-57.
55. McHugh GA, Campbell M, Luker KA. Predictors of outcomes of recovery following total hip replacement surgery: A prospective study. *Bone Joint Res* 2013; **2**(11): 248-54.
56. McMurray A, Grant S, Griffiths S, Letford A. Health-related quality of life and health service use following total hip replacement surgery. *J Adv Nurs* 2002; **40**(6): 663-72.
57. McMurray A, Grant S, Griffiths S, Letford A, Wilson, D. Mapping recovery after total hip replacement surgery: health-related quality of life after three years. *Aust J Adv Nurs* 2005; **22**(4): 20-5.
58. Navarro Collado MJ, Peiro S, Trenor Gomis C, Ruiz Jareno L, Perez Igualada A, Guerola Soler N. [Factors related to functional outcomes and quality of life after knee arthroplasty]. *Med Clin* 2000; **114**(7): 250-4.
59. Nunez M, Lozano L, Nunez E, et al. Total knee replacement and health-related quality of life: factors influencing long-term outcomes. *Arthritis Rheum* 2009; **61**(8): 1062-9.
60. Okoro T, Morrison V, Maddison P, Lemmey A, Andrew J. An assessment of the impact of behavioural cognitions on function in patients partaking in a trial of early home-based progressive resistance training after total hip replacement surgery. *Disabil Rehabil* 2013; **35**(23): 2000-7.
61. Papakostidou I, Dailiana ZH, Papapolychroniou T, et al. Factors affecting the quality of life after total knee arthroplasties: a prospective study. *BMC Musculoskelet Disord* 2012; **13**: 116.
62. Pua YH, Seah FJ, Poon CL, Tan JW, Liaw JS, Chong HC. Association between rehabilitation attendance and physical function following discharge after total knee arthroplasty: prospective cohort study. *Osteoarthritis Cartilage* 2017; **25**(4): 462-9.
63. Quintana JM, Escobar A, Aguirre U, Lafuente I, Arenaza JC. Predictors of health-related quality-of-life change after total hip arthroplasty. *Clin Orthop Relat Res* 2009; **467**(11): 2886-94.
64. Roubion RC, Fox RS, Townsend LA, Pollock GR, Leonardi C, Dasa V. Does Marital Status Impact Outcomes After Total Knee Arthroplasty? *J Arthroplasty* 2016; **31**(11): 2504-7.
65. Schafer T, Krummenauer F, Mettelsiefen J, Kirschner S, Gunther KP. Social, educational, and occupational predictors of total hip replacement outcome. *Osteoarthritis Cartilage* 2010; **18**(8): 1036-42.
66. Schnurr C, Jarrous M, Gudden I, Eysel P, Konig DP. Pre-operative arthritis severity as a predictor for total knee arthroplasty patients' satisfaction. *Int Orthop* 2013; **37**(7): 1257-61.
67. Serra-Sutton V, Allepuz A, Martinez O, Espallargues M, en nombre del Grupo de Trabajo de Evaluacion de las Artroplastias en Cataluna. [Quality of life-associated factors at one year after total hip and knee replacement: a multicentre study in Catalonia]. *Rev Esp Cir Ortop Traumatol* 2013; **57**(4): 254-62.
68. Sharma L, Sinacore J, Daugherty C, et al. Prognostic factors for functional outcome of total knee replacement: a prospective study. *J Gerontol A Biol Sci Med Sci* 1996; **51**(4): M152-7.
69. Shi H-YK, Khan M, Culbertson R, Chang J-K, Wang J-W, Chiu H-C. Health-related quality of life after total hip replacement: a Taiwan study. *Int Orthop* 2009; **33**(5): 1217-22.
70. Stephens MA, Fekete EM, Franks, MM, Rook KS, Druley JA, Greene K. Spouses' use of pressure and persuasion to promote osteoarthritis patients' medical adherence after orthopedic surgery. *Health Psychol* 2009; **28**(1): 48-55.

71. Sveikata T, Porvaneckas N, Kanopa P, et al. Age, Sex, Body Mass Index, Education, and Social Support Influence Functional Results After Total Knee Arthroplasty. *Geriatr* 2017; **8**(2): 71-7.
72. Tribe KL, Lapsley HM, Cross MJ, Courtenay BG, Brooks PM, March LM. Selection of patients for inpatient rehabilitation or direct home discharge following total joint replacement surgery: a comparison of health status and out-of-pocket expenditure of patients undergoing hip and knee arthroplasty for osteoarthritis. *Chronic Illn* 2005; **1**(4): 289-302.
73. van den Akker-Scheek I, Zijlstra W, Groothoff JW, van Horn JR, Bulstra SK, Stevens M. Groningen orthopaedic exit strategy: Validation of a support program after total hip or knee arthroplasty. *Patient Educ Couns* 2007; **65**(2): 171-9.
74. Vogl M, Wilkesmann R, Lausmann C, Hunger M, Plotz W. The impact of preoperative patient characteristics on health states after total hip replacement and related satisfaction thresholds: a cohort study. *Health Qual Life Outcomes* 2014; **12**: 108.
75. Vogel M, Riediger C, Krippel M, Frommer J, Lohmann C, Illiger S. Negative Affect, Type D Personality, Quality of Life, and Dysfunctional Outcomes of Total Knee Arthroplasty. *Pain Res Manag* 2019; Article ID 6393101: 6393101.
76. Weinberg DB, Lushenhop RW, Gittel JH, Kautz CM. Coordination between formal providers and informal caregivers. *Health Care Manage Rev* 2007; **32**(2): 140-9.
77. Wylde V, Trela-Larsen L, Whitehouse MR, Blom AW. Preoperative psychosocial risk factors for poor outcomes at 1 and 5 years after total knee replacement. *Acta Orthop* 2017; **88**(5): 530-6.
78. Xia RF, Li JF, Yan JY, Zhang SL. The quality of life and curative effect among elder patients after total knee replacement surgery for severe knee osteoarthritis. [Chinese]. *Chinese Journal of Tissue Engineering Research* 2014; **18**(40): 6438-43.
79. Ostendorf M, Buskens E, van Stel H, et al. Waiting for total hip arthroplasty: avoidable loss in quality time and preventable deterioration. *J Arthroplasty* 2004; **19**(3): 302-9.
80. Stephens MA, Druley JA, Zautra AJ. Older adults' recovery from surgery for osteoarthritis of the knee: psychosocial resources and constraints as predictors of outcomes. *Health Psychol* 2002; **21**(4): 377-83.
81. Sanchez-Santos MT, Garriga C, Judge A, et al. Development and validation of a clinical prediction model for patient-reported pain and function after primary total knee replacement surgery. *Sci Rep* 2018; **8**(1): 3381.
82. Fekete EM, Stephens MA, Druley JA, Greene KA. Effects of spousal control and support on older adults' recovery from knee surgery. *J Fam Psychol* 2006; **20**(2): 302-10.
83. Jiang Y, Sanchez-Santos MT, Judge AD, Murray DW, Arden NK. Predictors of Patient-Reported Pain and Functional Outcomes Over 10 Years After Primary Total Knee Arthroplasty: A Prospective Cohort Study. *Journal Arthroplasty* 2017; **32**(1): 92-100.
84. Song F, Eastwood A, Gilbody S, Duley L, Sutton AJ. Publication and related biases. *Health Technology Assessment* 2000; **4** (10): 1-115.
85. Smith TO, Dainty JR, MacGregor AJ. Changes in social isolation and loneliness following total hip and knee arthroplasty: longitudinal analysis of the English Longitudinal Study of Ageing (ELSA) cohort. *Osteoarthritis Cartilage* 2017; **25**(9): 1414-9.
86. Sullivan MJ, Thorn B, Haythornthwaite JA, et al. Theoretical perspectives on the relation between catastrophizing and pain. *Clin J Pain* 2001; **17**(1): 52-64.
87. Keefe FJ, Blumenthal J, Baucom D, et al. Effects of spouse-assisted coping skills training and exercise training in patients with osteoarthritic knee pain: a randomized controlled study. *Pain* 2004; **110**(3): 539-49.
88. McHugh GA, Luker KA. Individuals' expectations and challenges following total hip replacement: a qualitative study. *Disabil Rehabil* 2012; **34**(16): 1351-7.

89. Johnson EC, Horwood J, Gooberman-Hill R. Trajectories of need: understanding patients' use of support during the journey through knee replacement. *Disabil Rehabil* 2016; **38**(26): 2550-63.
90. Perry MA, Hudson S, Ardis K. "If I didn't have anybody, what would I have done?": Experiences of older adults and their discharge home after lower limb orthopaedic surgery. *J Rehabil Med* 2011; **43**(10): 916-22.
91. Gardiner C, Geldenhuys G, Gott M. Interventions to reduce social isolation and loneliness among older people: an integrative review. *Health Soc Care Community* 2018; **26**(2): 147-57.
92. Lenguerrand E, Artz N, Marques E, et al. Effect of group-based outpatient physiotherapy on function after total knee replacement: The ARENA randomised controlled trial. *Arthritis Care Research* in press.
93. Wylde V, Marques E, Artz N, Blom AW, R G-H. Effectiveness and cost-effectiveness of a group-based pain self-management intervention for patients undergoing total hip replacement: feasibility study for a randomized controlled trial. *Trials* 2014; **15**(176).
94. Turner AJ, Nikolova S, Sutton M. The effect of living alone on the costs and benefits of surgery amongst older people. *Soc Sci Med* 2016; **150**: 95-103.