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A mapping review on preoperative prognostic factors and outcome measures of revision total knee arthroplasty

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Aims

To map literature on prognostic factors related to outcomes of revision total knee arthroplasty (rTKA), to identify extensively studied factors and to guide future research into what domains need further exploration.

Methods

We performed a systematic literature search in MEDLINE, Embase, and Web of Science. The search string included multiple synonyms of the following keywords: "revision TKA", "outcome" and "prognostic factor". We searched for studies assessing the association between at least one prognostic factor and at least one outcome measure after rTKA surgery. Data on sample size, study design, prognostic factors, outcomes, and the direction of the association was extracted and included in an evidence map.

Results

After screening of 5,660 articles, we included 166 studies reporting prognostic factors for outcomes after rTKA, with a median sample size of 319 patients (30 to 303,867). Overall, 50% of the studies reported prospectively collected data, and 61% of the studies were performed in a single centre. In some studies, multiple associations were reported; 180 different prognostic factors were reported in these studies. The three most frequently studied prognostic factors were reason for revision (213 times), sex (125 times), and BMI (117 times). Studies focusing on functional scores and patient-reported outcome measures as prognostic factor for the outcome after surgery were limited (n = 42). The studies reported 154 different outcomes. The most commonly reported outcomes after rTKA were: re-revision (155 times), readmission (88 times), and reinfection (85 times). Only five studies included costs as outcome.

Conclusion

Outcomes and prognostic factors that are routinely registered as part of clinical practice (e.g. BMI, sex, complications) or in (inter)national registries are studied frequently. Studies on prognostic factors, such as functional and sociodemographic status, and outcomes as healthcare costs, cognitive and mental function, and psychosocial impact are scarce, while they have been shown to be important for patients with osteoarthritis.

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Introduction

Revision total knee arthroplasty (rTKA) can be a complex procedure, which is illustrated by generally worse outcomes when compared to primary TKA[1-5] Ideally, a good prediction model can help to identify the patients with increased risk of unfavourable outcomes. However, no valid prediction models exist for rTKA.[6,7] Prediction models that have been developed for primary TKA could provide a good starting point, but have generally insufficient discriminative ability, and poor

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external validity.[8] Making clinically relevant prediction models requires data that comprehensively cover multiple domains of both patient factors and outcomes.

An evidence map can provide valuable information to guide future research into what domains need further exploration, that eventually can help better understanding and prediction of outcome following rTKA. This map reflects which domains or topics are studied extensively, and which are understudied, thus reflecting the gaps of knowledge. Some prognostic factors and outcomes are easily accessible and acquired as they are part of routine registration (e.g. BMI and sex). Therefore, it is expected that the domains which are part of routine registration, in patient records or registries, are relatively well studied. On the other hand, there are likely a number of variables, identified by stakeholders as a relevant factor or outcome, that are more difficult to obtain. Relevant domains for patients with osteoarthritis (OA) have been previously identified by the International Consortium for Health Outcomes Measurement (ICHOM) and Osteoarthritis Research Society International Standing Committee for Clinical Trials Response Criteria Initiative and the Outcome Measures in Rheumatology (OMERACT-OARSI). They have developed standard sets of variables and outcomes that guide researchers and clinicians in the selection of variables important to patients with OA.[9,10]

In this study, we will perform a mapping review to provide an evidence map of the prognostic factors and outcome measures relevant for rTKA. The evidence map will be used to identify gaps of knowledge and identify factors and outcomes that have been more extensively studied. These findings can guide future research with the overall goal to further our understanding of rTKA and to improve outcome prediction.

Methods

Protocol and registration. We performed and reported a mapping review following the PRISMA guidelines for scoping reviews, as there is no alternative guideline for mapping reviews.[11] The study protocol was registered at Open Science Framework.[12]

Eligibility criteria. We searched for studies assessing the association between at least one prognostic factor and at least one outcome measure after rTKA surgery. We included only articles written in English. The population of interest was patients who underwent a rTKA. We excluded reviews, case reports and studies not including humans (e.g. cadaver or animal studies). All preoperative prognostic variables (e.g. demographical, diagnostic, and psychological variables) reported in combination with any type of outcomes (e.g. clinical, patient-reported outcome measures (PROMs), or functional outcomes) were included.

Search strategy. To map the current literature, we carried out a systematic literature search from date of inception to December 2022 in MEDLINE, Embase, and Web of Science. The search strategy included multiple synonyms of the terms "rTKA" and "outcome" and "prognostic factor". The synonyms were searched in subject headings and words restricted to title and abstract, as detailed in our study protocol (Supplementary material i).[12]

Selection of sources of evidence. The search strategy was performed by one author (MB). Duplicates were removed from the results of the search strategy. The studies were screened in two phases. First, the titles and abstracts of all articles were screened for eligibility by two authors (MB, BR). Second, all full-text articles that were included on the basis of the abstract, were retrieved and evaluated on eligibility by the same two authors. In both steps, consensus was sought, but when no consensus could be reached, a third review author (KS) was consulted.

Data charting process and data items. Of the papers included in this review, we extracted data on publication date, journal, sample size, study design, prognostic factor(s), outcome measures, and the categories that were used for prognostic factors and/or outcome measures. Additionally, we noted the direction of the association between the prognostic factor and outcome measure. Associations that were reported as statistically significant, were defined as either a positive (e.g. more satisfied or less re-revisions) or a negative effect (e.g. more complications or worse functional scores). Non-significant associations were defined as non-significant. The direction of the effect was transformed so that the same reference category was used in all studies using that particular prognostic factor. For example, for sex, female was always used as reference group. Also, the absence of a specific comorbidity, patient or disease characteristic, and a low BMI, age, or American Society of Anaesthesiologists (ASA) score were used as a reference category.

Furthermore, we extracted data about the type of analysis that was used for testing the association, and whether it was corrected for confounding variables or not. In case of multivariate models, we also extracted how the independent variables were selected. Data was extracted by one author (MB). Next, the prognostic factors and outcomes were grouped in different categories to structure the results. Outcomes were grouped based on the OMERACT-OARSI core outcome domain set for hip and knee OA, consisting of the following domains: adverse events (including mortality), patient's global assessment of target joint, quality of life, physical function, pain, joint structure (changes in joint structure on imaging), costs, sleep, psychosocial impact, participation, effect on family/caregivers, fatigue, cognitive function (covering both cognitive and mental functioning), and clinician global assessment of target joint.[10] Prognostic factor categories were: case-mix factors (such as age and sex), comorbidity, functional status, indication for surgery, lab test, medical history, medical history knee specific, and

patient-reported health status (or PROMs). The prognostic factor categories were based on the ICHOM standard set for hip or knee OA,[9] extended with components of the preoperative screening, namely: indication for surgery, lab test, and medical history. An overview of all prognostic factors, outcomes, and their categories can be found in Supplementary Tables ii and iii.

Critical appraisal of individual sources of evidence. Given the nature of a mapping review, we did not assess the risk of bias of the included studies. We did extract information about the study design regarding the prospective or retrospective nature of data collection, and if the study was conducted in a single or multicentre set-up.

Synthesis of results. We used descriptive statistics to report the findings. R (version 4.1.3; R Foundation for Statistical Computing, Austria) was used to make a graphical overview of the literature using the ggplot2 package (version 3.3.5) and an online, interactive overview with the shiny package (version 1.7.1).[13–15]

Results

The literature search resulted in 6,548 articles after removing duplicates. An overview of the identification of studies can be found in Figure 1. After the full-text screening, a total of 166 studies assessing the association between prognostic factors and outcome measures after rTKA surgery were included in this review (Table I). In 50% of the studies, the data was collected prospectively, and the majority included patients from a single centre (61%; 101/166). The median sample size of the studies was 319 (30 to 303,867). In 98/166 of studies (59%), a multivariate model was used to study the association between the prognostic factors and the outcomes. In most studies (52%; 51/98), the covariates in the model were reported as a set of variables that the authors prespecified as confounders of the association between prognostic variable and the outcome. The other most common methods for variable selection were based on the p-value of univariate association (19%; 19/98 studies), or building the model using stepwise or backward selection based on the Akaike Information Criterion (AIC; 12%; 12/98 studies). In the other studies, propensity score matching or machine learning methods were used to select confounders, or methods for confounder selection were not reported.

Prognostic factors of rTKA. A total of 180 different prognostic factors were found in the included studies. The three most frequently reported prognostic factors were reason for revision, sex, and BMI. Reason for revision was described 213 times in 68/166 studies (41%), sex 125 times in 76/166 studies (46%), and BMI 117 times in 64/166 studies (38%). Studies focusing on functional scores and PROMs as prognostic factor for the outcome after surgery were limited (n = 42). The prognostic factors that were most frequently reported to have a statistically significant association with the outcomes of rTKA, either positive or negative, were reason for revision, age, sex, BMI, and opioid use. Prognostic factors that are recommended by ICHOM, but have not been described in the included literature were education level, living condition, and work status.

Outcomes of rTKA. The studies reported 154 different outcomes. The most frequently used outcome category was adverse events, of which the majority of the studies reported re-revision, readmission, and reinfection after rTKA. Re-revision was described 155 times in 46/166 studies (28%), readmission 88 times in 23/166 studies (14%), and reinfection 85 times in 15/166 studies (9%). Costs, psychosocial impact, and quality of life outcomes were scarce. Only five studies included costs as outcome; in four out of five studies, this was limited to direct in-hospital costs of the surgery. Four studies included cognitive and mental function as outcome, measured using Patient-Reported Outcomes Measurement Information System (PROMIS) mental score, 36-Item Short Form Survey (SF-36) mental health, and Veterans RAND 12 Item Health Survey (VR-12) Mental Component Summary (MCS). In all, 17 studies used the 12-Item Short Form Survey (SF-12), SF-36, EuroQol five-dimension (EQ-5D), or Knee injury and Osteoarthritis Outcome Score quality of life subscale (KOOS-QoL) to assess quality of life after rTKA. Outcome categories recommended in the OMERACT-OARSI set that were not described in the included studies were joint structure, sleep, psychosocial impact, effect on family/caregiver, fatigue, and clinician global assessment of target joint.

Associations between prognostic factor and outcome. A graphical overview of all studied combinations of prognostic factors and different outcome measures is presented in Figure 2. There is also an interactive version of the plot.[180]

The combinations of prognostic factor and outcome categories that were studied most often were comorbidities with adverse events (402 times reported in 54 studies), case-mix factors with adverse events (368 times reported in 79 studies), and indication of surgery with adverse events (160 times reported in 62 studies; Table II). The association between prognostic factors measuring functional status or PROMs with any type of outcomes after rTKA were the least frequently studied combination. Associations that were most frequently reported as statistically significant, either a positive or negative effect, were age and re-revision (12 times reported positive, one time reported negative, and eight times reported non-significant), reason for revision and re-revision (13 times reported negative, eight times reported non-significant), and reason for revision and mortality (nine times reported negative, one time reported non-significant).

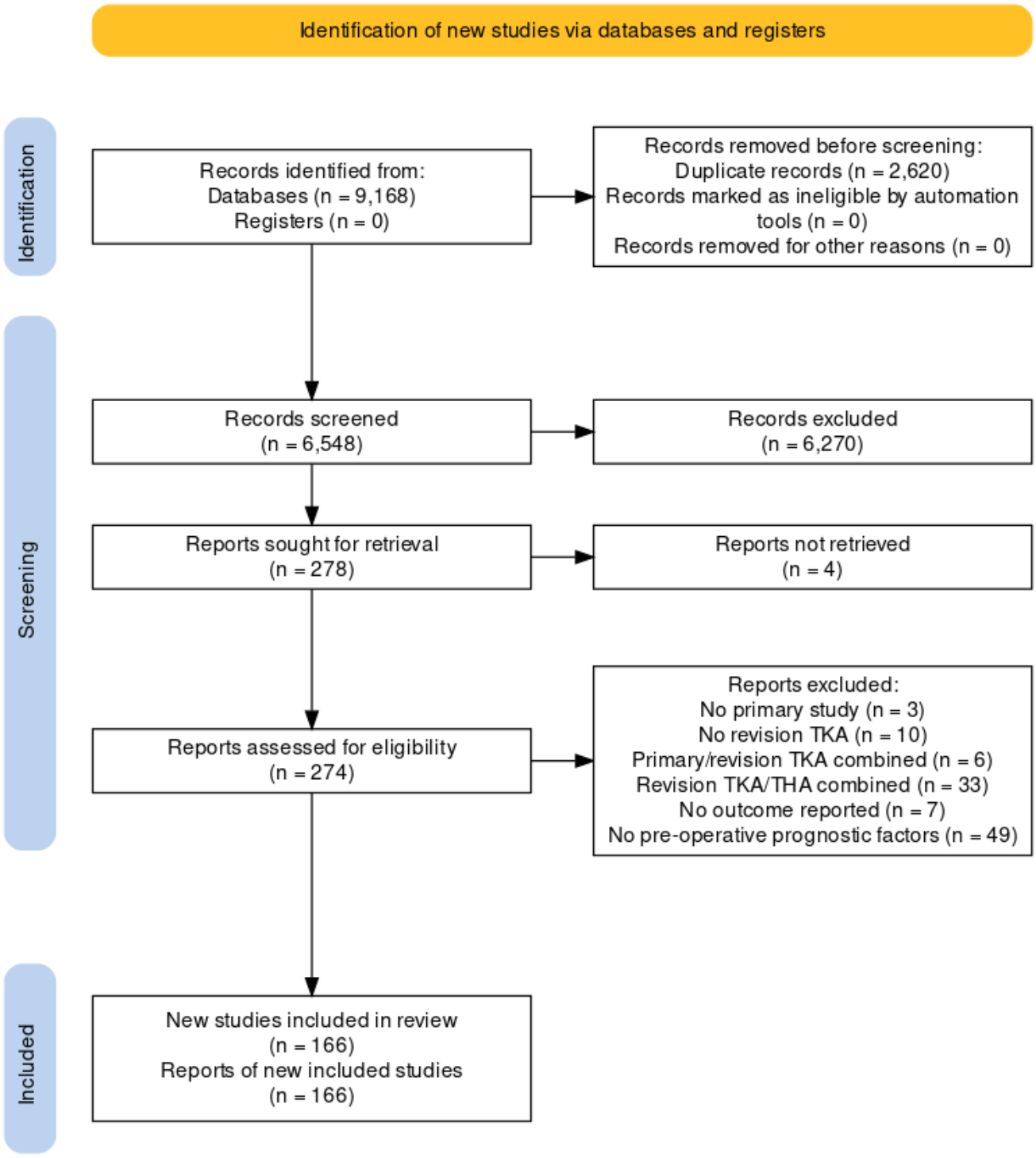

Fig. 1
Flowchart of the literature search.

Discussion

The goal of the study was to provide an evidence map of studies on prognostic factors and outcomes of rTKA. Adverse events were the most frequently reported outcomes. The most frequently used prognostic factors were reason for revision, sex, and BMI. These factors were also most frequently associated with the outcome of revision. Both the most used prognostic factors and clinical outcomes are usually part of routine registration in (electronic) patient records or as part of (national) registries.

Table I. Included literature.

First author	Year	Sample size	Type study	Centre	Association	Covariable selection for multivariate models	Prognostic factors	Outcomes
Aali-Rezaie[16]	2018	1,344	retrospective	single	multi	p-value univariate	red blood cell distribution width	complications, length of stay, mortality, readmission
Abram[17]	2021	40,854	retrospective	multi	multi	set of covariables	age, sinus tract, BMI, *Staphylococcus aureus*, culture negative PJI	reinfection
Aggerwal[18]	2014	168	prospective	single	multi	set of covariables	age, BMI, sex, infection	re-revision
Akkaya[19]	2022	66	retrospective	single	uni		planned surgery	length of stay, consultation with health professional
Apinyankul[20]	2022	238	retrospective	single	multi	p-value univariate	reason for revision	complications, re-revision
Arndt[21]	2022	3,354	retrospective	multi	uni		reason for revision, age, sex, Charlson comorbidity index, opioid use	opioid use
Bae[22]	2013	224	prospective	single	uni		age, sex, reason for revision	re-revision
Baek[23]	2021	78	retrospective	single	uni		age, sex, ethnicity, BMI, smoking, reason for revision, Charlson comorbidity index, ASA, diabetes mellitus, COPD, congestive heart failure, renal failure, metastatic cancer, bleeding disorders, wound infection	mortality
Baker[24]	2012	797	prospective	multi	uni		reason for revision	EQ-5D, OKS, satisfaction
Barrack[25]	2002	135	prospective	multi	multi	stepwise selection	prior surgery, heterotopic ossification, BMI, sex, reason for revision	heterotopic ossification, KSS, ROM
Bass[26]	2021	25441	prospective	multi	multi	set of covariables	age, cancer, cerebrovascular disease, COPD, BMI, diabetes mellitus, ethnicity, heart failure, sex, history of VTE, inflammatory bowel disease, pulmonary hypertension, renal disease, rheumatoid arthritis, sleep apnoea, smoking, reason for revision, systemic lupus, thrombophilia, venous insufficiency	venous thromboembolism
Bedard[27]	2018	8,776	prospective	multi	multi	unknown	smoking	complications, infection, mortality, reoperation
Belmont[28]	2016	1,754	prospective	multi	uni		hypertension, cerebrovascular accident, sex	readmission
Belt[29]	2021	8,978	prospective	multi	uni		reason for revision	reinfection, re-revision
Bieger[30]	2013	97	prospective	single	uni		reason for revision	KSS
Boddapati[31]	2018	12,780	prospective	multi	multi	set of covariables	age, PJI, ASA, COPD, diabetes mellitus, smoking, BMI, sex	complications, blood transfusion, cardiac complications, readmission, cerebrovascular accident, deep surgical site infection, deep venous thrombosis, sepsis, length of stay, major complications, minor complications, mortality, non-home discharge, renal complications, urinary tract infection, wound dehiscence, respiratory complication, superficial surgical site infection
Carter[32]	2019	237	retrospective	single	uni		BMI	amputation, aseptic loosening, ICU admission, infection, manipulation under anaesthesia, mortality, wound complications
Chalmers[33]	2019	135	retrospective	single	multi	set of covariables	age, BMI, sex, prior revision, reason for revision	re-revision, re-revision for instability, re-revision for loosening
Chalmers[34]	2021	197	retrospective	single	multi	set of covariables	BMI, sex, prior revision, reason for revision	re-revision
Chalmers[35]	2021	163	retrospective	single	multi	set of covariables	reason for revision	OKS, EQ-VAS, EQ-5D, KSS, ROM
Chen[36]	2020	58	retrospective	single	multi	p-value univariate	BMI, anaerobic pathogens, cirrhosis, CRP, polymicrobial infection, virulent pathogens	reinfection
Chen[37]	2021	172	retrospective	single	uni		chronic viral hepatitis	infection, re-revision
Choi[38]	2014	176	prospective	single	multi	set of covariables	age, BMI, ASA, comorbidity, MRSA, sex, reason for revision	mortality
Christiner[39]	2022	144	retrospective	single	uni		sex, anticoagulant use, prior DAIR, smoking, sinus tract, BMI, ASA	infection
Chung[1]	2021	13,597	retrospective	multi	multi	set of covariables	coagulation	transfusion, cardiac arrest, myocardial infarction, pneumonia, reintubation, renal insufficiency

Continued

Table I. Continued

First author	Year	Sample size	Type study	Centre	Association	Covariable selection for multivariate models	Prognostic factors	Outcomes
Churchill[40]	2021	1,676	prospective	multi	multi	unknown	coagulation, age, ASA, bleeding disorders, blood urea nitrogen, BMI, Charlson comorbidity index, congestive heart failure, COPD, creatinine, diabetes mellitus, ethnicity, hypertension, smoking, sex	acute renal failure, length of stay, pneumonia, cerebrovascular accident, deep venous thrombosis, transfusion, sepsis, infection, unplanned intubation, wound disruption, urinary tract infection, mortality, myocardial infarction, on ventilator, pulmonary embolism, readmission, renal insufficiency, return to OR, septic shock, superficial surgical site infection, surgical site infection
Citak[41]	2019	183	retrospective	single	uni		age, depression, BMI, deep venous thrombosis, sex, polymicrobial infection, prior surgery, weight, Charlson comorbidity index, COPD, coronary heart disease, CRP, dementia, diabetes mellitus, haemoglobin, liver disease, prior arthroscopy, renal failure, rheumatoid arthritis, tumour history, white blood cell count	re-revision, reinfection
Cochrane[42]	2022	21,610	retrospective	multi	uni		age, sex, ethnicity, BMI, smoking, ASA, functional status, DM insulin dep, DM non-insulin dep, COPD, heart failure, liver disease, hypertension, renal failure, dialysis, cancer, steroid use, bleeding disorders	length of stay
Cochrane[43]	2022	157	retrospective	single	multi	set of covariables	BMI, diabetes mellitus, anaemia, smoking	postoperative infection
Cohen[44]	2019	8,559	prospective	multi	uni		Glomerular Filtration Rate	cardiac arrest, complications, death, deep venous thrombosis, deep wound infection, prolonged length of stay, fail to wean, myocardial infarction, organ infection, pneumonia, pulmonary embolism, reintubation, renal failure, wound dehiscence, urinary tract infection, renal insufficiency, return to OR, sepsis, septic shock, cerebrovascular accident, superficial surgical site infection
Courtney[45]	2018	10,848	prospective	multi	multi	set of covariables	reason for revision	cardiac arrest, complications, cerebrovascular accident, deep venous thrombosis, fail to wean, infection, mortality, myocardial infarction, pneumonia, pulmonary embolism, readmission, reintubation, renal failure, renal insufficiency, reoperation, sepsis, septic shock
Dahlgren[46]	2018	171	retrospective	single	uni		age, BMI, albumin, ASA, bleeding disorders, COPD, diabetes mellitus, dialysis, dyspnoea on exertion, ethnicity, packed cell volume, hypertension, International Normalized Ratio, platelet count, serum creatinine, smoking, steroid use, white blood cell count, sex	readmission
Dai[47]	2021	32,349	prospective	multi	multi	propensity score matched	reason for revision	anaemia, blood transfusion, cardiac complications, central nervous system, complications, costs, deep venous thrombosis, gastrointestinal complication, haematoma, length of stay, mortality, postoperative infection, pulmonary embolism, respiratory complication, urinary system complication, vascular complication, wound dehiscence
de Carvalho[48]	2015	30	retrospective	single	uni		BMI, reason for revision	WOMAC
Deehan[49]	2006	94	prospective	single	uni		prior revision	KSS
Deere[50]	2021	33,292	prospective	multi	uni		age, sex, prior revision	re-revision
DeMik[51]	2022	22,262	retrospective	multi	multi	p-value univariate	transfusion pre-op, packed cell volume, bleeding disorders, COPD	blood transfusion

Continued

Table I. Continued

First author	Year	Sample size	Type study	Centre	Association	Covariable selection for multivariate models	Prognostic factors	Outcomes
Dieterich[52]	2014	3,421	prospective	multi	multi	p-value univariate	age, ASA, dialysis, emergency operation, pulmonary disease, sex	complications
Dowdle[53]	2018	5,414	prospective	multi	multi	set of covariables	age, anxiety, depression, BMI, diabetes mellitus, smoking, sex, opioid use	manipulation under anaesthesia
Drain[54]	2022	222	retrospective	multi	uni		reason for revision	mortality, Charlson comorbidity index, mortality related to infection, mortality related to comorbidities, mortality due to myocardial infarction, mortality due to cerebrovascular event, mortality due to congestive heart failure, mortality due to pulmonary embolism, mortality due to liver failure, mortality due to respiratory failure, mortality due to renal failure, mortality due to cancer, mortality due to sepsis, mortality due to systemic inflammatory response syndrome, mortality due to multiple causes
Edmiston[2]	2019	14,486	retrospective	multi	multi	set of covariables	BMI, sex, AIDS, alcohol abuse, anaemia, cardiac arrhythmia, chronic pulmonary disease, bleeding disorders, congestive heart failure, connective tissue disorder, dementia, diabetes mellitus, fluid electrolyte disorder, lymphoma, metastatic cancer, peripheral vascular disease, renal failure, weight loss	surgical site infection
Faschingbauer[55]	2020	96	retrospective	single	uni		alcohol abuse, COPD, diabetes mellitus, heart failure, hypertension, renal failure, malignancies, rheumatoid arthritis, smoking	reinfection
Fassihi[56]	2020	10,973	retrospective	multi	multi	p-value univariate	steroid use	length of stay, mortality, septic shock
Fleischman[57]	2017	223	prospective	single	multi	backward selection	age, BMI, sex, reason for revision	re-revision
Fury[58]	2021	213	retrospective	single	uni		reason for revision	re-revision
Gao[59]	2019	260	retrospective	single	multi	set of covariables	surgical history	re-revision
Geary[60]	2020	1,632	retrospective	single	multi	unknown	age, sex, reason for revision	re-revision
Ghanem[61]	2007	93	prospective	single	multi	set of covariables	reason for revision	pain, SF-36 mental health, SF-36 physical, WOMAC function
Ghomrawi[62]	2009	308	prospective	multi	multi	set of covariables	age, BMI, comorbidity, extension contracture, sex, flexion contracture, reason for revision	pain, SF-36, Lower-Extremity Activity Scale (LEAS), WOMAC function
Goh[63]	2021	245	prospective	single	multi	set of covariables	age, BMI, Charlson comorbidity index, sex, reason for revision, SF-36 MCS	expectations, satisfaction
Grayson[64]	2016	177	prospective	single	uni		reason for revision	KSS clinical, KSS function, satisfaction, UCLA
Gu[65]	2018	9,921	prospective	multi	multi	p-value univariate	age, COPD, BMI, ASA, diabetes mellitus, sex	length of stay, complications, reoperation, mortality
Gu[66]	2020	13,246	prospective	multi	uni		DM insulin dep, DM non-insulin dep	cardiac arrest, death, deep surgical site infection, deep venous thrombosis, fail to wean, length of stay, myocardial infarction, organ infection, pneumonia, wound dehiscence, pulmonary embolism, urinary tract infection, transfusion, reintubation, renal failure, renal insufficiency, return to OR, sepsis, septic shock, cerebrovascular accident, superficial surgical site infection
Gu[67]	2021	13,313	prospective	multi	multi	p-value univariate	anaemia	bleeding, cardiac complications, complications, wound complications, urinary tract infection, length of stay, mortality, pulmonary complications, renal complications, return to OR, septic shock, thromboembolic event

Continued

Table I. Continued

First author	Year	Sample size	Type study	Centre	Association	Covariable selection for multivariate models	Prognostic factors	Outcomes
Gu[68]	2019	6,849	prospective	multi	multi	p-value univariate	blood transfusion	deep venous thrombosis, unplanned intubation, transfusion, fail to wean, myocardial infarction, organ infection, pneumonia, readmission, sepsis, septic shock
Gu[69]	2020	9,914	prospective	multi	multi		age, ASA, bleeding disorders, blood transfusion, diabetes mellitus, dyspnoea, ethnicity, functional status, renal failure, BMI, sex, COPD	prolonged length of stay, return to OR, cardiac arrest, complications, deep venous thrombosis, deep wound infection, fail to wean, mortality, myocardial infarction, organ surgical site infection, pneumonia, pulmonary embolism, reintubation, renal failure, renal insufficiency, sepsis, septic shock, cerebrovascular accident, superficial surgical site infection, urinary tract infection, wound dehiscence
Hagerty[70]	2021	615	retrospective	single	multi	set of covariables	type of infection	reinfection
Halder[71]	2020	23,664	prospective	multi	multi	set of covariables	hospital volume	adverse events, mortality, re-revision
Hamaway[72]	2022	106,534	retrospective	multi	uni		age, Charlson comorbidity index, BMI, ASA, reason for revision, renal disease, anaemia, diabetes mellitus, sex, smoking	prolonged length of stay
Hannon[73]	2022	60	retrospective	single	uni		age, sex, BMI	re-revision
Hardcastle[74]	2016	228	retrospective	single	uni		elevated CRP / ESR	aseptic loosening, instability, infection, fracture, re-revision
Hardeman[75]	2012	146	prospective	single	uni		age, tibial tuberositas osteotomy, time to revision, reason for revision	KSS clinical, KSS function, pain, re-revision
Heesterbeek[76]	2016	40	prospective	single	uni		ROM	KSS function, pain, satisfaction
Hernigou[77]	2017	72	retrospective	single	multi	set of covariables	primary diagnosis, reason for revision	KSS clinical, KSS function, re-revision, ROM, satisfaction
Hoell[78]	2016	59	retrospective	single	uni		BMI, blood transfusion, diabetes mellitus, periprosthetic fracture, smoking, tumour	reinfection
Ingall[79]	2021	330	prospective	single	uni	propensity score matched	opioid use	KOOS-PS, PROMIS physical, PROMIS mental, Physical Function SF10A
Jannelli[80]	2022	105	retrospective	single	uni		iron deficiency	length of stay, costs, acute renal injury, pneumonia, respiratory failure, ileus episode, urinary tract infection, myocardial infarction, cerebrovascular accident, deep venous thrombosis, surgical site infection, venous thromboembolism, pulmonary embolism, complications
Jeschke[81]	2022	34,643	retrospective	multi	multi	set of covariables	age, sex, BMI, fluid electrolyte disorder, cardiac arrhythmia, renal failure, congestive heart failure, valvular disease, bleeding disorders, neurological disease, alcohol abuse, drug abuse, psychoses, pulmonary circulation disorder, prior revision, anticoagulant use	blood transfusion
Kamath[82]	2017	4,551	prospective	multi	multi		albumin	acute renal failure, cardiac arrest, cardiac pulmonary complication, complications, wound disruption, unplanned intubation, urinary tract infection, transfusion, wound infection, cerebrovascular accident, deep surgical site infection, deep venous thrombosis, mortality, myocardial infarction, on ventilator, organ surgical site infection, pneumonia, pulmonary embolism, renal insufficiency, sepsis, septic shock, superficial surgical site infection, systemic infection
Kasmire[83]	2014	175	prospective	single	multi	set of covariables	BMI, sex, comorbidity, KSS function, KSS clinical, pain, stiffness	stiffness, WOMAC function, KSS function, pain

Continued

Table I. Continued

First author	Year	Sample size	Type study	Centre	Association	Covariable selection for multivariate models	Prognostic factors	Outcomes
Keswani[84]	2016	4,977	prospective	multi	multi	p-value univariate	age, BMI, ASA, cardiac disease, diabetes mellitus, ethnicity, hypertension, renal disease, pulmonary disease, smoking, cerebrovascular accident, sex, reason for revision	readmission
Kienzle[85]	2020	100	retrospective	single	uni		prior revision, ASA, sex	aseptic loosening, complications, infection
Kildow[86]	2022	178	retrospective	multi	uni		polymicrobial infection, antibiotic resistant organism, sex, prior two-stage revision, diabetes mellitus, chronic renal disease, coronary vascular disease, myocardial infarction, congestive heart failure, deep venous thrombosis, smoking, former smoking, systemic disease, chronic lung disease	reinfection
Kim[87]	2010	807	prospective	single	multi	set of covariables	age, BMI, sex, ROM, time to revision, reason for revision	stiffness
Kim[88]	2019	77	prospective	single	multi	backward selection	central sensitization	satisfaction, pain, stiffness, WOMAC function
Kingsbury[89]	2022	263	prospective	multi	multi	propensity score matched	age, sex, primary diagnosis, index of multiple deprivation, reason for revision, elixhauser comorbidity index	mortality
Kirschbaum[90]	2022	63	retrospective	single	uni		reason for revision, BMI, sex, age	re-revision
Klasan[91]	2020	1,720	prospective	multi	multi	p-value univariate	age, sex, ASA, time to revision	re-revision, OKS
Klasan[92]	2021	633	retrospective	single	multi	set of covariables	obesity, smoking, diabetes mellitus	reoperation, re-revision, amputation above knee, infection, extensor mechanism failure, ligamentous laxity, malposition, stiffness
Klemt[93]	2022	2,228	retrospective	single	multi	recursive feature elimination through random forest algorithms	diabetes mellitus, opioid use, sex, age, social status, ethnicity, reason for revision, insurance status, ASA	non-home discharge
Klemt[94]	2022	2,512	retrospective	single	multi	artificial intelligence, best predictors		
Kubista[95]	2011	368	retrospective	single	multi	backward selection	age, BMI, sex, comorbidity, diabetes mellitus, type of infection, rheumatoid arthritis	reinfection
Kurd[96]	2010	102	prospective	single	uni		age, BMI, ASA, sex, DAIR, diabetes mellitus, type of infection, smoking, steroid use	reinfection
Labaran[97]	2020	18,359	prospective	multi	multi	set of covariables	haemodialysis-dependent	complications, infection, length of stay, mortality, readmission, costs, septicaemia
Labaran[98]	2020	7,459	retrospective	multi	multi		renal transplant	infection, length of stay, major complications, mortality, readmission, septicaemia
Larson[99]	2021	110	retrospective	single	multi	set of covariables	reason for revision, sex, age, Charlson comorbidity index, obesity, index of multiple deprivation, geographical rurality, ethnicity	mortality
Laudermilch[100]	2010	103	retrospective	single	uni		MRSA	activity of daily living limitation, SF-36, KSS clinical, KSS function, WOMAC
Lee[101]	2017	206	retrospective	single	uni		reason for revision	Hospital for Special Surgery score (HSS), KSS, ROM, WOMAC
Lee[102]	2020	16,428	prospective	multi	multi	p-value univariate	DM insulin dep, DM non-insulin dep	blood transfusion, cerebrovascular accident, death, deep surgical site infection, deep venous thrombosis, prolonged length of stay, myocardial infarction, pneumonia, unplanned intubation, urinary tract infection, pulmonary embolism, readmission, renal failure, renal insufficiency, return to OR, sepsis, superficial surgical site infection

Continued

Table I. Continued

First author	Year	Sample size	Type study	Centre	Association	Covariable selection for multivariate models	Prognostic factors	Outcomes
								acute renal failure, blood transfusion, cardiac arrest, cerebrovascular accident, deep surgical site infection, deep venous thrombosis, prolonged length of stay, wound disruption, unplanned intubation, ventilator dependence, urinary tract infection, length of stay, mortality, myocardial infarction, organ surgical site infection, pneumonia, pulmonary embolism, renal insufficiency, return to OR, septic shock, superficial surgical site infection, non-home discharge, systemic sepsis
Lee[103]	2020	5,204	prospective	multi	multi		chronic renal disease	
Leta[104]	2015	145	prospective	multi	multi	set of covariables	age, sex, patella resurfacing	re-revision
Liang[105]	2018	224	retrospective	single	uni		age, sex, primary diagnosis	re-revision
Lindberg-Larsen[106]	2022	3,118	retrospective	single	multi	set of covariables	prior revision, walking aid, BMI, haemoglobin, cardiac disease, pulmonary disease, psychiatric disorder pharmacologically treated, DM insulin dep, age, sex, elixhauser comorbidity index, hospital volume	length of stay, readmission, mortality
Liodakis[107]	2015	2,425	prospective	multi	multi	AIC	age, BMI, ASA, bleeding disorders, COPD, diabetes mellitus, heart failure, packed cell volume, hypertension, smoking, sex	major complications, prolonged length of stay
Lopez-de-Andres[108]	2017	1,390	prospective	multi	uni		diabetes mellitus, hypertension, smoking, BMI, reason for revision	anaemia, cardiac complications, central nervous system, complications, deep venous thrombosis, gastrointestinal complication, genitourinary complications, haematoma, infection, length of stay, mortality, peripheral vascular disease, wound dehiscence, urinary tract infection, pulmonary embolism, renal failure, respiratory complication, septic shock
Lu[109]	2017	6,830	prospective	multi	multi	p-value univariate	anaemia	complications, length of stay, mortality, readmission
Luque[110]	2014	125	retrospective	single	multi	p-value univariate	age, renal failure, rheumatoid arthritis, tibial tuberositas osteotomy, reason for revision	re-revision
Ma[111]	2018	108	retrospective	single	multi	p-value univariate	ASA, age, BMI, sex, gout	treatment success
Mahomed[112]	2005	11,726	prospective	multi	uni		age, comorbidity, ethnicity, sex, Medicaid	complications, mortality, reoperation
Malviya[113]	2012	120	prospective	single	multi	set of covariables	age, BMI, reason for revision	WOMAC, satisfaction, SF-36
Malviya[114]	2012	120	prospective	single	multi	set of covariables	age, BMI, sex, comorbidity, reason for revision	SF-36 bodily pain, SF-36 physical, WOMAC function, WOMAC pain
Massin[115]	2016	285	retrospective	multi	multi	p-value univariate	age, BMI, sex, diabetes mellitus, pathogen, prior infection	reinfection
Matar[116]	2021	1,298	retrospective	single	multi	set of covariables	reason for revision	mortality
Matar[117]	2021	292	prospective	single	multi	forward selection	age, sex, haemoglobin, ASA, arterial hypertension, anticoagulant use, myocardial infarction, chronic heart disease, diabetes mellitus, chronic renal disease, COPD, BMI	blood loss
Meyer[118]	2021	235	retrospective	multi	uni		age, sex, reason for revision	re-revision
Mortazavi[119]	2011	499	prospective	single	uni		age, BMI, bilateral, cancer, comorbidity, diabetes mellitus, gastrointestinal disease, cardiac disease, inflammatory arthritis, liver disease, renal disease, cerebrovascular accident, thyroid disease, vascular arterial disease, vascular venous disease, sex, reason for revision	infection, re-revision
Mulhall[120]	2007	291	prospective	multi	multi	set of covariables	BMI	Lower-Extremity Activity Scale (LEAS), KSS, re-revision, WOMAC function, WOMAC pain

Continued

Table I. Continued

First author	Year	Sample size	Type study	Centre	Association	Covariable selection for multivariate models	Prognostic factors	Outcomes
Nikolaus[121]	2016	1,802	retrospective	single	uni		age, BMI, ASA, comorbidity, liver disease, smoking, sex	infection
Novicoff[122]	2009	308	retrospective	multi	uni		low back pain	Lower-Extremity Activity Scale (LEAS), SF-36, KSS, WOMAC clinical, WOMAC function
Oganesyan[123]	2021	1,689	retrospective	single	uni		prior arthroscopy	mortality, readmission, re-revision, re-revision for aseptic loosening, re-revision for infection, re-revision for instability, re-revision for pain, re-revision for stiffness
Patil[124]	2009	56	prospective	single	multi	set of covariables	reason for revision	KSS, satisfaction, SF-36 mental health, SF-36 physical
Piuzzi[125]	2020	246	prospective	single	multi		age, BMI, ethnicity, sex, pain, prior surgery, reason for revision, ROM, smoking	pain, KOOS quality of life, KOOS-PS, VR-12 MCS, VR-12 PCS
Pun[126]	2008	67	retrospective	single	uni		sex, reason for revision	KSS, pain
Quinn[127]	2022	202	retrospective	single	uni		sex, age, weight, BMI, reason for revision, prior revision, ROM	OKS, ROM
Rajgopal[128]	2018	184	retrospective	single	uni		failed DAIR	KSS, time to re-revision, re-revision, ROM, re-revision for infection
Rajgopal[129]	2013	142	retrospective	single	uni		reason for revision	re-revision, ROM
Reeves[130]	2018	46,836	prospective	multi	uni		reason for revision	length of stay, mortality, readmission
Ritter[131]	2004	355	prospective	single	uni		age, preoperative alignment, preoperative flexion, sex	flexion, extension
Ro[132]	2018	144	retrospective	single	multi	stepwise selection	age, primary diagnosis, ROM, BMI, sex, reason for revision	Hospital for Special Surgery score (HSS), KSS clinical, KSS function, ROM
Ross[133]	2022	51,548	retrospective	multi	multi	unknown	hepatitis C, reason for revision	any medical complication, deep venous thrombosis, pulmonary embolism, acute renal injury, urinary tract infection, transfusion, readmission, complications, manipulation under anaesthesia, re-revision, periprosthetic joint infection, aseptic loosening, periprosthetic fracture
Rossmann[134]	2021	40	retrospective	single	uni		age, sex	reinfection
Roth[135]	2019	9,773	prospective	multi	multi	set of covariables	BMI	adverse events, major complications, minor complications, readmission, reoperation
Russo[136]	2022	108	retrospective	single	multi	set of covariables	reason for revision, organ transplant	length of stay, readmission, re-revision, mortality
Sabah[137]	2021	10,329	prospective	multi	multi	backward selection	age, disability, EQ-5D 3 L anxiety/depression, EQ-5D 3 L self-care, OKS	OKS change
Sabry[138]	2014	3,809	retrospective	single	multi	p-value univariate	ASA, diabetes mellitus, preoperative antibiotics, prior infection, sex, prior surgery	infection, reinfection
Sakellariou[139]	2015	110	prospective	single	multi	backward selection	age, BMI, ASA, sex, comorbidity, MRSA	reinfection
Samuel[140]	2020	3,531	retrospective	multi	multi	unknown	age, sex, BMI, smoking, ASA, prior surgery, CRP, type of infection	re-revision
Schairer[141]	2014	1,408	retrospective	single	multi	stepwise selection	reason for revision	readmission
Schwarze[142]	2022	157	retrospective	single	uni		positive cultures	re-revision
Shen[143]	2022	414	retrospective	multi	uni		KSS function, ROM, coronal deviation, tibial malrotation, age, pain	KSS function
Sheng[144]	2006	2,637	prospective	multi	multi	p-value univariate	age, sex, primary diagnosis, time to revision, reason for revision	re-revision
Sinclair[145]	2021	32,354	retrospective	multi	uni		age, sex, BMI, vascular disease, hypertension, diabetes mellitus, malignancy, renal failure, CRP, causative pathogen	readmission
Singh[146]	2014	1,533	prospective	single	multi	set of covariables	comorbidity, anxiety, depression	knee function
Singh[147]	2013	4,090	prospective	single	multi	set of covariables	age, ASA, BMI, comorbidity, sex, reason for revision	periprosthetic fracture
Singh[148]	2011	2,695	prospective	single	multi		age, BMI, comorbidity, sex	pain
Singh[149]	2013	725	prospective	single	multi	set of covariables	ipsilateral hip involvement	activity of daily living limitation, pain

Continued

Table I. Continued

First author	Year	Sample size	Type study	Centre	Association	Covariable selection for multivariate models	Prognostic factors	Outcomes
Singh[150]	2013	1,533	prospective	single	multi	set of covariables	connective tissue disorder, COPD, diabetes mellitus, cardiac disease, peripheral vascular disease, anxiety, renal disease, depression	pain
Singh[151]	2010	1,533	prospective	single	multi	set of covariables	age, comorbidity, BMI, sex	walking aids, activity of daily living limitation
Singh[152]	2014	1,533	prospective	single	multi	set of covariables	comorbidity, age, BMI, anxiety, depression, sex	narcotic pain medication, NSAIDs
Singh[153]	2014	1,533	prospective	single	multi	set of covariables	reason for revision	activity of daily living limitation, pain
Siqueira[154]	2017	438	retrospective	single	uni		reason for revision	re-revision
Sisko[155]	2019	174	prospective	single	uni		BMI	deep infection, KSS, reoperation, re-revision, SF-12, WOMAC
Sloan[156]	2019	15,286	prospective	multi	multi	set of covariables	BMI	deep venous thrombosis, pulmonary embolism
Sodhi[157]	2020	28,779	prospective	multi	multi	set of covariables	depression, BMI, sex, opioid use, alcohol abuse, cannabis abuse, bleeding disorders, congestive heart failure, diabetes mellitus, electrolyte imbalance, hypertension, hypothyroidism, iron deficiency, peptic ulcer, renal failure, rheumatoid arthritis, sleep apnoea	surgical site infection
Staats[158]	2017	98	retrospective	single	uni		positive minor criteria for PJI	re-revision
Sternheim[159]	2012	102	retrospective	single	uni		reason for revision	KSS clinical, KSS function, narcotic pain medication, pain, ROM
Suarez[160]	2008	566	retrospective	single	uni		age, reason for revision	re-revision
Theil[161]	2022	119	retrospective	single	uni		reason for revision, prior revision	re-revision
Traven[162]	2019	16,304	prospective	multi	multi	set of covariables	frailty	complications, mortality, readmission, non-home discharge
Turnbull[163]	2019	112	retrospective	single	multi	p-value univariate	age, sex, OKS, prior revision, social deprivation Scottish index of multiple deprivation, reason for revision, UCLA activity	OKS, UCLA
Upfill-Brown[164]	2022	303,867	retrospective	multi	uni		age, sex	pain
van den Kieboom[165]	2021	79	retrospective	single	uni		age, BMI, ASA, sex, smoking, alcohol use, drug use, renal disease, cardiovascular disease, hypertension, diabetes mellitus, malignant tumour, inflammatory disease, depression, haematological disease, neurological disease, pulmonary disease	re-revision
van Kempen[166]	2013	150	prospective	single	uni		reason for revision	complications, KSS clinical, KSS function, pain, ROM, satisfaction
van Laarhoven[167]	2022	100	prospective	single	multi	backward selection	age, sex, BMI, reason for revision	reoperation
van Rensch[168]	2020	129	prospective	single	uni	mixed model	reason for revision	KSS clinical, KSS function, pain, ROM, satisfaction
Verbeek[169]	2019	295	retrospective	single	multi	backward selection	age, sex, KSS function, reason for revision	KSS function
Wang[170]	2004	48	prospective	single	uni		reason for revision	KSS, pain, ROM, SF-12
Watts[171]	2014	111	prospective	single	multi	one confounder	age, BMI, sex, DAIR, diabetes mellitus, negative culture, rheumatoid arthritis, smoking	reinfection, reoperation, re-revision
Watts[172]	2015	186	prospective	single	multi	one confounder	BMI	KSS function, pain, periprosthetic joint infection, reoperation, re-revision
Wilson[173]	2020	13,973	retrospective	multi	multi	set of covariables	depression	emergency department visit, prolonged length of stay, infection, wound complications, pain related ED visit, periprosthetic joint infection, readmission, re-revision, sepsis, thromboembolic event, costs, opioid use, non-home discharge

Continued

Table I. Continued

First author	Year	Sample size	Type study	Centre	Association	Covariable selection for multivariate models	Prognostic factors	Outcomes
Wilson[174]	2020	11,786	retrospective	multi	multi	set of covariables	opioid use	emergency department visit, prolonged length of stay, opioid overdose, infection, pain related ED visit, periprosthetic joint infection, readmission, wound complications, re-revision, sepsis, thromboembolic event, non-home discharge
Winther[175]	2022	178	prospective	single	uni		reason for revision	pain during mobilization, pain at rest, KOOS-PS, KSS, EQ-5D
Xiong[176]	2021	197	retrospective	single	uni		reason for revision	extension deficit, flexion, pain, ROM, stiffness
Xu[177]	2019	1224	prospective	single	multi	set of covariables	sinus tract	mortality, treatment failure
Yapp[178]	2021	8,894	prospective	multi	multi	set of covariables	age, sex, comorbidity, hospital volume, reason for revision	re-revision
Yapp[179]	2022	8,343	retrospective	multi	multi	set of covariables	reason for revision	mortality, KSS clinical, KSS function, Koval grade

ASA, American Society of Anaesthesiologists; COPD, chronic obstructive pulmonary disease; DAIR, debridement, antibiotics, and implant retention; DM, diabetes mellitus; EQ-5D, EuroQol five-dimension; EQ-5D EQ-5D-3L, EuroQol five-imension three-level; EQ-VAS, EuroQol visual analogue scale; ICU, intensive care unit; KOOS-PS, Knee Injury and Osteoarthritis Outcome Score – Physical Function Short Form; KSS, Knee Society Score; VR-12 MCS, Veterans rand 12 item mental health component summary; MRSA, methicillin-resistant *Staphylococcus aureus*; NSAID, non-steroidal anti-inflammatory drug; OKS, Oxford Knee Score; OR, operating room; VR-12 PCS, Veterans Rand 12 item physical health component summary; PJI, periprosthetic joint infection; PROMIS, Patient-Reported Outcomes Measurement Information System; ROM, range of motion; SF-36, 36-Item Short Form Survey; UCLA, University of California at Los Angeles; VTE, venous thromboembolism; WOMAC, Western Ontario and McMaster Universities Osteoarthritis Index.

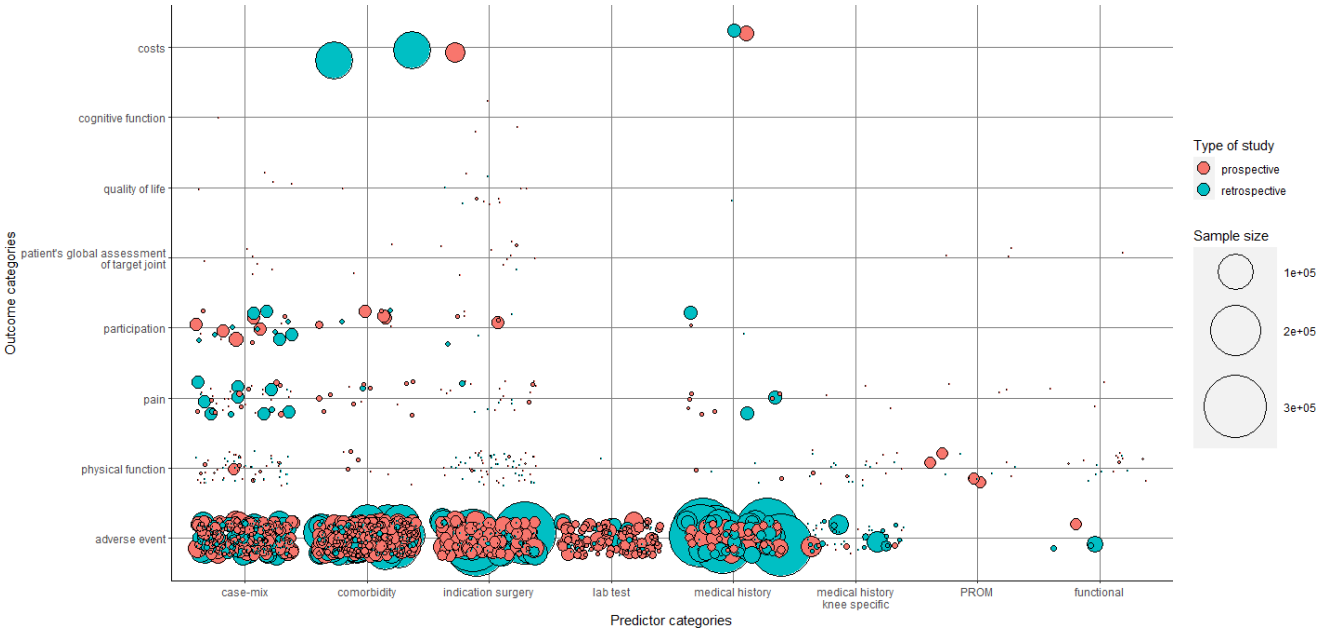

Fig. 2

Bubble plot of associations reported in the included studies.

This mapping review also identified some gaps of knowledge. Factors such as education level, living condition, and work status were not reported in the included literature at all. Also, PROMs (measuring for instance quality of life, functional status or pain) and functional tests were not often evaluated as prognostic factors. Whereas in primary TKA, prediction models have showed that a low preoperative OKS (assessing pain and function), patient-reported anxiety or depression, and higher preoperative pain ratings are associated with worse outcomes.[181–183] The predictive value of these factors in revision TKA patients remains to be investigated. Moreover, these domains also matter to patients with OA, according to ICHOM.[9] Together, this highlights the importance of investigating these domains in rTKA.

In the current healthcare environment, it might be useful to evaluate whether subgroups can be identified where rTKA is more cost-effective. Studies where both quality of life and costs are studied simultaneous, cost-effectiveness studies, were lacking in this evidence map. The direct costs of the surgery were only included as outcome in four studies. However, none of these four studies included the net costs; all surgical costs minus medical costs from averted adverse events and

Table II. Number of times a combination of prognostic factor, and outcome is reported (number of unique studies).

Prognostic factor categories	Outcome categories								
	Adverse event	Physical function	Pain	Participation	Patients global assessment of target joint	Quality of life	Cognitive function	Costs	Total
Case-mix	368 (79)	60 (20)	39 (11)	22 (7)	6 (1)	4 (2)	1 (1)	0 (0)	500 (102)
Comorbidities	402 (54)	7 (6)	13 (6)	8 (5)	2 (1)	1 (1)	0 (0)	2 (1)	435 (66)
Indication surgery	160 (62)	63 (30)	22 (14)	9 (6)	10 (8)	11 (8)	3 (3)	1 (1)	279 (92)
Lab test	126 (21)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	127 (21)
Medical history	101 (30)	5 (2)	9 (4)	3 (3)	0 (0)	1 (1)	0 (0)	2 (2)	121 (35)
Medical history, knee specific	50 (28)	23 (11)	3 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	76 (35)
PROMs	0 (0)	12 (4)	3 (3)	0 (0)	3 (2)	0 (0)	0 (0)	0 (0)	18 (7)
Functional	4 (3)	16 (8)	3 (3)	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	24 (12)
Total	1,211 (122)	187 (47)	92 (26)	42 (14)	22 (10)	17 (10)	4 (4)	5 (4)	1,580 (166)

PROMs, patient-reported outcome measures.

treatments. In addition, studies reporting quality of life and psychosocial impact are scarce, while improving these are important for the patient.[9,10,184] During the development of the ICHOM standard set, all patients and experts of OA agreed that quality of life should be included as an outcome in the set.[9] In a study of patients' perspectives after arthroplasty, the patients prioritized pain relief, improved function, and restored quality of life as most important outcomes after hip and knee arthroplasty.[184] Previous studies showed that revision hip and knee arthroplasty increased the quality-adjusted life year (QALY), although the gain in QALY was lower compared to primary arthroplasty.[185,186] Also, there seems to be a considerable variation in patient outcomes across the procedures, hinting at the need to identify patients at risk for poor outcome.[186]

Considering preoperative psychological factors when looking at pain and functional outcomes might be of importance.[187] The evidence map shows that anxiety and depression is mainly studied in association with adverse events, one study looked into the association between anxiety/depression with physical function. Although patient-reported physical functioning and pain seems to be linked with self-reported anxiety and depression in older adults and patients with knee arthroplasty, this association is lacking in this evidence map.[187,188]

Although over 100 different prognostic factors and outcomes were described in the included literature, they were not all completely unique. Some factors represented the same construct, but had different operationalizations. For instance, the outcomes re-revision for infection, postoperative infection, reinfection, periprosthetic joint infection, and (superficial/deep) surgical site infection all described an adverse event related to infection, in a specific location or in general. Overlap in variables was also observed in the prognostic factors; some studies reported the presence of comorbidities in general, others reported multiple specific comorbidities such as diabetes mellitus, renal failure and chronic obstructive pulmonary disease. Thus, the variety in variables found in literature is slightly lower than the evidence map suggests.

Limitations. The main limitation of the evidence map is that it only reflects the factors and outcomes that are most commonly studied, which are not necessarily the most important ones. Limitations of the individual studies might also affect the quality of the evidence map. Not all studies corrected the association between the prognostic factor and outcome for potentially confounding variables. In a minority of studies, only univariate associations were reported. The other studies did correct for confounding variables, but it is not unlikely that the models were wrongly specified and also included colliders or mediators in the multivariate models.[189] The heterogeneity in model specification combined with differences between populations could partly explain the variation in associations (i.e. negative, non-significant, or positive) between a single prognostic factor and outcome that were found in the current review. As a result, the direction of the association found could deviate from the actual association.

In conclusion, the evidence map can be used to guide future research. As expected, the most frequently reported variables in rTKA studies were those that are typically registered in electronic patient files or as part of registries. While these measures are of importance in clinical settings, to further our understanding of outcomes of rTKA, it might be valuable to focus on the factors and outcomes that are studied to a lesser extent. Important gaps in literature include functional measures, psychological factors, and sociodemographic variables as prognostic factor, costs, and psychosocial impact as outcomes. Research focused on these gaps could provide a more comprehensive perspective on outcomes after rTKA and contribute to better prediction.

Take home message

- Outcomes and prognostic factors that are routinely registered as part of clinical practice (e.g. BMI, sex, complications) or in (inter)national registries are studied frequently.
- Significant gaps in literature (such as functional and sociodemographic status, and outcomes as healthcare costs and psychosocial impact) that were identified could guide future research with the overall goal to further our understanding of revision total knee arthroplasty and to improve outcome prediction.

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Supplementary material

Search strategy per database, and tables of prognostic factor and outcome categories.

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