

Specific Question:

What factors determine poor functional outcome following Total Knee Replacement (TKR)?

Clinical bottom line

All groups derived benefit from undergoing a TKR, reviews suggests that the decision to refer patients for surgery should not be based on patient characteristics.

However, people who are obese may have a poorer functional outcome, than those who are not obese, following a TKR. Being older and female also predicts a poorer functional outcome. Other factors that may predict dissatisfaction with TKR at 12 months are depression, pain in other joints and ongoing pain in the operated knee, older age at the time of surgery and greater co-morbidity.

Recommendations for Practice

Clinicians who are referring patients for a TKR should be aware of the modifiable and non modifiable factors that predict poorer functional outcome and greater dissatisfaction following TKR surgery.

Modifiable factors are: depression, pain elsewhere, co-morbidity, pain, obesity
Non modifiable factors are: age and gender

Why is this important?

Total knee replacement is a very common procedure, mainly undertaken for osteoarthritis (97%, National Joint Registry 2010). During 2010 there were 76,870 primary total knee replacements undertaken in England and Wales (National Joint Registry 2010). In the NHS, 67% were undertaken, 24% in Independent Hospitals, 6% in Independent Sector Treatment Centres (ISTCs) and 3% in NHS treatment centres. The mean age at surgery was 67.5 years and BMI is higher in patients receiving TKR compared to total hip replacements.

It is important that patients have appropriate information about the predictors of poor outcome following a total knee replacement. It is also important that clinicians who are referring patients for this intervention should be aware of the modifiable and non modifiable predictors of poor functional outcome.

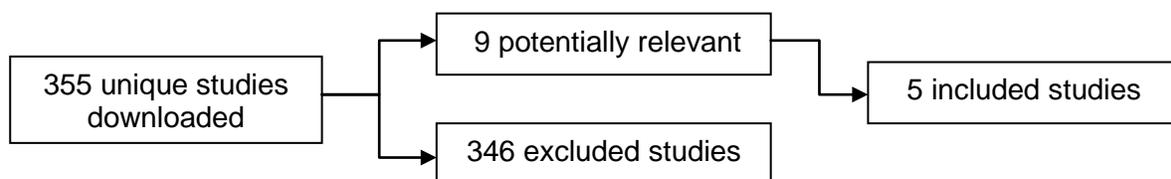
Inclusion Criteria

| | Description | Search terms |
|---|--|---|
| Population and Setting | Adult patients receiving Total Knee Replacement Any age | Arthroplasty, Total Knee Replacement, OA |
| Intervention or Exposure (ie what is being tested) | Total Knee Replacement Predictors of outcome | Arthroplasty, Total Knee Replacement, satisfaction, dissatisfaction |
| Comparison, if any | none | |
| Outcomes of interest | Pain, function, return to work, quality of life, medical consultations | Pain, function, return to work, quality of life |
| Types of studies | Observational cohort studies | SR, RCTs cohort studies |

| Databases Searched | Date of last search | No. downloaded |
|------------------------------|---------------------|----------------|
| Clinical Knowledge Summaries | | |
| PEDro | | |
| BMJ Updates | | |
| Clinical Evidence | | |
| TRIP Database | | |
| NICE | | |
| HTA | | |
| Bandolier | | |
| The Cochrane Library | | |
| Medline | | |
| Cinahl | | |
| Embase | | |
| PsycInfo | | |
| Professional websites | | |
| | 355 | 9 |

Time frame 1991-2012

Results



| First Author, year and type of study | Population and setting | Intervention or exposure tested | Study results | Assessment of quality and comments |
|---|--|--|---|--|
| 1.Santaguida et al 2008 Systematic review | Studies with over 500 patients | TKR | All groups derived benefit Poorer functional outcome if older female, also obese | |
| 2.Scott et al 2010 Prospective observational study | 1217 consecutive patients SF12 Oxford knee score | TKR | 18% unsure or dissatisfied | No validation data on satisfaction questionnaire used |
| 3.Gandi et al 2010 Retrospective review | 551 consecutive patients on joint registry 1998-2005 | TKR WOMAC SF36 Follow up at 3 years | Older age, greater co-morbidity, poorer mental status predicted poor outcome | 17% had missing data points Canadian population may affect generalisability |
| 4.Alzahrani et al 2011 Prospective cohort | Canada 2 academic teaching hospitals | TKR What predicted no improvement at 12 months Use WOMAC and Oxford Knee Score | 11% reported no improvement at 1 year. Greater age and being male predicted poor outcome | Canadian population may affect generalisability |
| 5.Carr et al 2012 RCT and registries | Searched 1970- Dec 2010 | TKR | Narrative review Patients less than 55 and those who are obese have more varied outcome from surgery | |

Review of included studies (Study abstract followed by our brief review)

1. Santaguida et al 2008

Abstract Total joint arthroplasty is a highly efficacious and cost-effective procedure for moderate to severe arthritis in the hip and knee. Although patient characteristics are considered to be important determinants of who receives total joint arthroplasty, no systematic review has addressed how they affect the outcomes of total joint arthroplasty. This study addresses how patient characteristics influence the outcomes of hip and knee arthroplasty in patients with osteoarthritis.

Methods Four bibliographic databases were searched (MEDLINE 1980–2001, CINAHL 1982–2001, EMBASE 1980–2001, HealthStar 1998–1999) for studies involving more than 500 patients with osteoarthritis and one or more of the following outcomes after total joint arthroplasty: pain, physical function, postoperative complications (short-and long-term) and time to revision. Prognostic patient characteristics of interest included age, sex, race, body weight, socioeconomic status and work status. **Results** Sixty-four of 14 276 studies were eligible for inclusion and had extractable data. Younger age (variably defined) and male sex increased the risk of revision 3-fold to 5-fold for hip and knee arthroplasty. The influence of weight on the risk of revision was contradictory. Mortality was greatest in the oldest age group and among men. Function for older patients was worse after hip arthroplasty (particularly in women). Function after knee arthroplasty was worse for obese patients. **Conclusion** Although further research is required, the findings suggest that, after total joint arthroplasty, younger age and male sex are associated with increased risk of revision, older age and male sex are associated with increased risk of mortality, older age is related to worse function (particularly among women), and age and sex do not influence the outcome of pain. Despite these findings, all subgroups derived benefit from total joint arthroplasty, suggesting that surgeons should not restrict access to these procedures based on patient characteristics. In addition, future research needs to provide standardized measures of outcomes.

Summary of Santaguida et al 2005

- Aim: to assess how patient characteristics influence the outcome of hip and knee arthritis.
- Searched 4 data bases (Medline, CINAHL, Embase and Healthstar from 1980-2001). Searched for studies with over 500 patients with OA.
- Outcomes were pain, function, post op complications, and time to revision. 64 out of 14 276 studies were eligible, validity scoring criteria used.
- Younger age and being male increased risk of revision of TKR 3 to 5 fold.
- Influence of weight was contradictory.
- Mortality was greatest risk to the male older age group.
- Function was worse for obese patients.
- Older age associated with poorer physical function especially in women.
- All groups derived benefit and review suggests that decision to refer patient for surgery should not be based on patient characteristics

2.Scott et al 2010- Dissatisfaction following TKR

Abstract: Up to 20% of patients are not satisfied with the outcome following total knee replacement (TKR). This study investigated the pre- and post-operative predictors of dissatisfaction in a large cohort of patients undergoing TKR. 1217 consecutive patients were assessed between 2006 and 2008 both before operation and six months after, using the Short-form (SF)-12 health questionnaire and the Oxford Knee Score. Detailed information concerning co-morbidity was gathered. Satisfaction was measured at one year when 18.6% (226 of 1217) of patients were unsure or dissatisfied with their replacement and 81.4% (911 of 1217) were satisfied or very satisfied. Multivariate

regression analysis was performed to identify independent predictors of dissatisfaction. Significant ($p < 0.001$) predictors at one year included the pre-operative SF-12 mental component score, depression and pain in other joints, the six-month SF-12 score and poorer improvement in the pain element of the Oxford Knee Score.

Patient expectations were highly correlated with satisfaction. Satisfaction following TKR is multifactorial. Managing the expectations and mental health of the patients may reduce dissatisfaction. However, the most significant predictor of dissatisfaction is a painful total knee replacement.

Summary of Scott et al 2010

- Aim: to investigate the predictors of dissatisfaction in a large cohort of patients undergoing TKR.
- Between 2006-2008, 1290 consecutive TKRs (1217 patients), all followed standard post op regime, data collected prospectively.
- Outcome SF12 , Oxford Knee Score. Pre-op questionnaires complete and collected pre-op by nurse. Follow up questionnaires at 6 and 12 months. Also at 12 months collected satisfaction data, Questionnaires collected at routine follow up
- 18% unsure or dissatisfied with outcome.
- *At one year*-Low SF12 mental component scores, depression, pain in other joints were found to be highly significant predictors of dissatisfaction.
- On-going pain in the operated knee was the most significant predictor of dissatisfaction.
- Limitations- prospective, no validation data on the satisfaction questionnaire used, single site trial

3.Gandi et al 2010 Predicting the longer term outcome s of total knee arthroplasty

Abstract This study explored the patient level predictors (age, gender, body mass index, education, ethnicity, mental health, and comorbidity) for a sustained functional benefit at a minimum of 1 year follow-up after total knee arthroplasty(TKA). Five hundred fifty-one consecutive patients were reviewed from a joint registry between the years of 1998 and 2005. Baseline demographic data and the outcome scores of the Western Ontario McMaster University Osteoarthritis Index (WOMAC) and Medical Outcomes Short-Form 36 (SF36) scores were extracted from the database. Longitudinal regression modeling was performed to identify the predictive factors of interest. 27% of data points missing. The mean follow-up in the cohort was 3.0 years (range 1-8 years) and there were no revisions performed during this time. Clinical outcome scores were found to be relatively constant for 3-4 years after surgery and then demonstrated a gradual decline after that. Older age, year of follow-up, greater co-morbidity, and a poorer mental health state at time of surgery were identified as negative prognostic factors for a sustained functional outcome following TKR ($P < 0.05$). Knowledge of these factors that predict outcomes should be used in setting appropriate patient expectations of surgery.

Summary of Gandhi et al 2012

- This was a Canadian study whose aim was to identify the patient predictors for sustained functional outcome following TKR for primary OA at a minimum of 1 year follow up.
- Same cemented implant, 2 surgeons, identical post op protocol.
- 551 consecutive patients reviewed from joint registry between 1998-2005.
- Baseline data, WOMAC, SF36 extracted from database. Mean follow up time was 3 years (1-8 years), clinical outcome constant at 3-4 years after surgery then demonstrate a gradual decline after that.
- Older age time of surgery, year of follow up (or time since surgery), greater co morbidity, and poorer mental health status at the time of surgery were identified as negative prognostic factors
- Knowledge of these factors would help to manage patient expectations
- 27% had missing data points. Canadian large teaching hospital and may not be generalisable

4. Alzahrani et al 2011 Prevalence of clinically significant improvement following total knee replacement

Objective. Although total knee replacement (TKR) has a high reported success rate, the pain relief and functional improvement after surgery vary. The purpose of the retrospective cohort study was to determine the prevalence of patients showing no clinically important improvement 1 year after TKR, and patient factors that may predict this outcome. **Methods.** The primary TKR registry data was reviewed from two academic hospitals: the Toronto Western Hospital and the Hamilton Health Sciences Henderson Hospital in Ontario, Canada. Relevant covariates including demographic data, body mass index, and comorbidity were recorded. Knee joint pain and functional status were assessed at baseline and at 1-year followup with the Western Ontario McMaster University Osteoarthritis Index (WOMAC) and Oxford Knee Score (OKS) to measure the change using the minimal clinically important difference (MCID). Logistic regression modeling was used to identify the predictors of interest. **Results.** Overall, 11.7% (373/3177) of patients reported no clinically important improvement 1 year after surgery. Logistic regression modeling showed that a greater patient age independently predicted no clinically important improvement on the WOMAC scale 1 year after surgery ($p = 0.0003$), while being male independently predicted no clinically important improvement on the OKS 1 year after surgery ($p = 0.008$). **Conclusion.** Awareness of the prevalence of patients who may show no clinically important improvement and factors that predict this outcome will help patients and surgeons set realistic expectations of surgery.

Summary of Alzahrani et al 2010

- Aim: to report the prevalence of patients showing no clinically important improvement at 1 year post op following a total knee replacements
- Retrospective cohort study. The aim was to determine the prevalence of no clinically important improvements at 1 year and patient factors that may predict these outcomes.
- Data from two academic hospitals in Ontario, Canada was reviewed. Demographic data, BMI, comorbidity were recorded.
- Pain and function assessed at baseline and 1 year- WOMAC, Oxford Knee Score (OKS). Logistic regression used to identify predictors
- Surgery between 1997-2007. Clear exclusions. N= 3177.
- 11% reported no improvement at 1 year.
- Greater age predicted no clinically important improvement on WOMAC, whilst being male predicted no clinically improvement on the OKS.
- Older age at the time of surgery and being male predicted those with no clinically important difference following surgery.
- Limitations academic hospital population in Canada.

5. Carr et al 2012

Abstract: Knee-replacement surgery is frequently done and highly successful. It relieves pain and improves knee function in people with advanced arthritis of the joint. The most common indication for the procedure is osteoarthritis. The epidemiology of and risk factors for knee replacement were reviewed. Because replacement is increasingly considered for patients younger than 55 years, improved decision making about whether a patient should undergo the procedure is needed. The assessment of surgery outcomes based on data for revision surgery from national joint-replacement registries and on patient-reported outcome measures is discussed. Widespread surveillance of existing implants is urgently needed alongside the carefully monitored introduction of new implant designs. Developments for the future are improved delivery of care and training for surgeons and clinical teams. In an increasingly ageing society, the demand for knee-replacement surgery will probably rise further, and we predict future trends. The authors also emphasise the need for new strategies to treat early-stage osteoarthritis, which will ultimately reduce the demand for joint-replacement surgery.

Summary of Carr et al 2012

- Aim: to review the epidemiology and risk factors for total knee replacement.
- Narrative review, Pubmed and Medline search Jan 1970-Dec 2010, appropriate search terms used, focussed on trials and registries, only English language publications.
- Highlights that TKR has been a successful intervention, considered to be safe and cost effective treatment for ends stage osteoarthritis.
- Good overview of epidemiology, risk factors and joint registry information. Identifies that most of the published literature is single surgeon- inventor of implant, which could introduce bias and conflict of interest

Summary

Systematic review evidence suggests that being obese results in a poorer functional outcome following a TKR. Being an older woman is also predicted a poorer functional outcome.

Factors that may predict dissatisfaction with TKR at 12 months are depression, pain in other joints and ongoing pain in the operated knee, older age at the time of surgery, greater co-morbidity.

Conclusions

Clinicians who refer patients for total knee replacement surgery should be aware of the prognostic risk factors. No author suggest these factors should be used as a means of rationing. Recognising these factors may help clinicians facilitate treatment of other aspects of health prior to or whilst awaiting surgery.

References

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