

**Evaluation of Functional Outcome Following Total Knee Replacement in Patients with Knee Osteoarthritis****Pappu Kumar<sup>1</sup>, Solanki Animesh Mahendrabhai<sup>2</sup>, Kukadiya Hiteshbhai Labhubhai<sup>3</sup>**<sup>1</sup>Assistant Professor, Department of Orthopaedics, Gouri Devi Institute of Medical Sciences & Hospital, Durgapur, West Bengal, India<sup>2</sup>Associate Professor, Department of Orthopaedics, Gouri Devi Institute of Medical Sciences & Hospital, Durgapur, West Bengal, India<sup>3</sup>Associate Professor, Department of Orthopaedics, Gouri Devi Institute of Medical Sciences & Hospital, Durgapur, West Bengal, India

Received: 04-09-2022 / Revised: 12-10-2022 / Accepted: 25-11-2022

Corresponding Author: Dr. Solanki Animesh Mahendrabhai

Conflict of interest: Nil

**Abstract:****Background:** Knee OA is a frequent condition in the elderly causing pain, stiffness and immobility in the knee joint. The treatment of such patients is often by total knee replacement surgery.**Aim:** The aim of this study is to assess functional outcome following total knee replacement in patients with knee osteoarthritis.**Methodology:** The methodology adopted for the study was prospective study of 150 patients suffering from knee osteoarthritis, T.K.R. procedure in Department of Orthopaedics, Gouri Devi Institute of Medical Sciences & Hospital, Durgapur, West Bengal, India. The functional outcome was evaluated using Knee Society Score, range of motion, pain relief and post-operative complications.**Results:** There was a high proportion of overweight (47.3%) and predominantly female study population (61.3%). The mean Knee Society score was significantly higher after surgery ( $84.9 \pm 7.2$ ) than pre-surgery ( $42.6 \pm 8.4$ ). Range of movements improved from  $78.4^\circ \pm 12.5^\circ$  to  $112.6^\circ \pm 10.3^\circ$ . Low complications and excellent/good functional outcome was observed in 84% of the patients.**Conclusion:** The total knee replacement has been seen to provide effective results by improving the functional outcome with few complications.**Keywords:** Knee osteoarthritis, Total knee replacement, Functional outcome, Knee Society Score, Range of motion, Pain relief.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

**Introduction**

Knee osteoarthritis is one of the most common types of degenerative joint disease and a major cause of morbidity, pain and disability in the elderly worldwide [1]. It causes the loss of the articular cartilage, narrowing of the joint space, bony enlargement, stiffness and movement difficulties [2]. The increasing prevalence of knee osteoarthritis is attributed to certain risk factors such as old age, female gender, obesity, trauma and physical inactivity. Non-operative management such as use of analgesics, physiotherapy, weight loss, and intra-articular therapy can be considered in the early stages of the disease; but surgery is recommended in cases of advanced stages [3].

Total knee replacement has been shown to be very effective in treating patients with end-stage knee osteoarthritis [4]. The advantages of TKR are significant such as pain relief, better stability, better ROM (range of motion) and functional outcome, and improvement of quality of life of these patients

[5]. Following technical changes, changes in prosthesis design and postoperative rehabilitation protocol, there can be differences in postoperative results depending on the individual, including age, BMI, comorbidities, and adherence to rehabilitation protocols [6].

Evaluation of outcome of the procedure is crucial in assessing the success of treatment and in formulating subsequent management strategy [7]. Parameters like Knee Society Score (KSS), pain relief, range of motion and postoperative complications are frequently taken into consideration for the assessment [8]. Hence it was decided to undertake the present study to see the functional outcome after total knee replacement in patients admitted with knee osteoarthritis in a tertiary care teaching hospital.

**Background of the Study:** In older individuals, knee osteoarthritis is a degenerative condition that

results in pain, deformities and stiffness of the affected joints and a state of physical inactivity [9]. This disorder causes disability among affected individuals and increases the socio-economic burden on health care organizations across the globe. In recent times, knee replacement surgery is widely accepted as the gold standard approach for treating severe cases of osteoarthritis that are resistant to conservative management [10]. The primary aim of total knee replacement is to relieve the pain, correct any deformity, and improve joint mobility [11]. It is very essential to evaluate the effectiveness of this type of surgery in relation to functional outcomes after operation. Knee Society Score, range of movement, pain alleviation, and post-operation complications are some of the key variables that need to be considered during this evaluation process.

#### **Functional Outcome Following Total Knee Replacement in Knee Osteoarthritis Patients:**

The functional outcome after total knee arthroplasty includes the benefits of reduction in pain, increase in mobility and stability of joints, improved range of motion and general well-being as a result of surgery in patients with osteoarthritis of the knee joint [12]. The procedure of total knee arthroplasty can be regarded as a useful intervention in patients with osteoarthritis that involves severe pain and impairment of their daily activities even after receiving conservative treatment [13]. Good postoperative functional outcome typically implies that pain is alleviated, walking ability improves, the range of joint motions increases, and physical activity becomes easier [14].

#### **Research Objectives**

The objectives of the study are:

- To evaluate the functional outcome of total knee replacement in patients with osteoarthritis using Knee Society Score (KSS) assessment.
- To evaluate the outcome of the range of motion and mobility after total knee replacement surgery.
- To assess the effectiveness of total knee replacement surgery to relieve pain and enhance the functional activities of OA patients.
- To study the demographic and clinical characteristics of the patients undergoing total knee replacement, age, gender, BMI.
- To assess postoperative complications and safety of total knee replacement in patients with osteoarthritis.

**Methodology:** The current research has been carried out in order to determine the impact that the total knee replacement surgery has had on the

functional recovery in patients who have osteoarthritis.

**Study Design:** The study was conducted as a hospital-based prospective observational study.

**Study Area:** The study was conducted in Department of Orthopaedics, Gouri Devi Institute of Medical Sciences & Hospital, Durgapur, West Bengal, India

**Study Duration:** The study took place for one year.

**Study Participants:** A total of 150 patients diagnosed with osteoarthritis of the knee and undergoing total knee replacement surgery were included in the study.

#### **Inclusion Criteria**

- Patients 45 years old or older. Patients with primary osteoarthritis of the knee joint.
- Patients who have a unilateral or bilateral total knee arthroplasty.
- Patients who give their consent to join the study.
- Patients who can be seen for follow-up after surgery.

#### **Exclusion Criteria**

- Patients with inflammatory arthritis, e.g., rheumatoid arthritis.
- Patients with prior knee surgery (arthroplasty).
- Patients with trauma-related or septic arthritis of the knee joint.
- Patients with serious systemic disease precluding surgery.
- Patients who refuse participation in the research study.

**Sample Size:** The sample size comprised 150 patients fulfilling the inclusion criteria during the study period.

**Procedure:** The Institutional Ethics Committee approval was taken prior to including the patients in the study. Consent was taken from all the subjects involved in the study.

Comprehensive history taking and demographic analysis including age, gender, body mass index, duration of symptoms, along with comorbidity if any were taken in predesigned format. Clinical assessment and radiologic assessment of the affected knee joint were done before surgery.

Surgery in the form of total knee replacement was performed on all the subjects involved in the study under aseptic conditions in the Department of Orthopaedics, Gouri Devi Institute of Medical Sciences & Hospital, Durgapur under the guidance of qualified orthopaedic surgeons. Post-operative rehabilitation programs like physiotherapy were

followed up with all the patients involved in the study.

Functional assessment was made based on the Knee Society Scores and range of movement in pre-operative and post-operative settings respectively. Follow-up was done on monthly basis for first three months and at sixth and twelfth months post-surgery.

**Statistical Analysis:** The obtained data were fed into Microsoft Excel and further processed using SPSS software version 25.0. Numerical values were expressed in mean and standard deviation, while the categorical data were expressed in

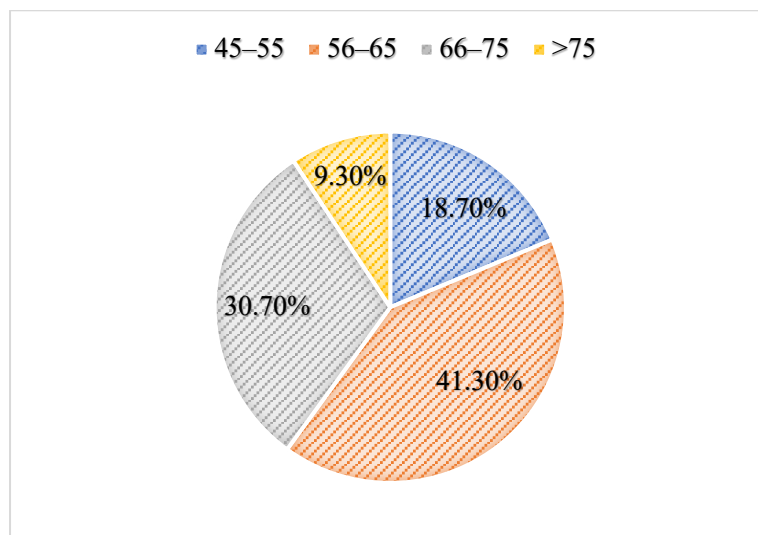
numbers and percentages. Wherever necessary, paired t-test and Chi-square tests were done to compare the values. The p-value was taken to be statistically significant when below 0.05.

**Results**

Total number of osteoarthritis cases of the knee having undergone total knee replacement was 150 patients. Demographic, clinical, KSS, range of motion, pain relief, and post-operative complications were measured as a means of evaluating post-operative results in regard to function.

**Table 1: Distribution of Patients Based on Age Grouping**

Age Group (Years)	Number of Patients (n=150)	Percentage (%)
45-55	28	18.7%
56-65	62	41.3%
66-75	46	30.7%
>75	14	9.3%



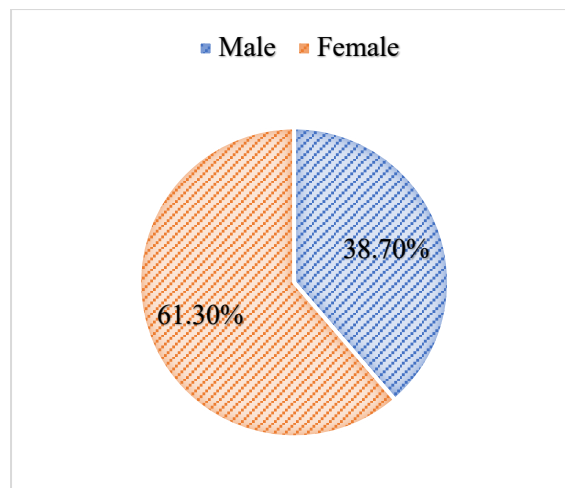
**Figure 1: Graphical Presentation of Patient Distribution with Respect to Age Groups**

It was found that the age group 56-65 had the highest number of patients getting TKR surgery with 41.3% (62) patients. Also, the age group (66-

75 years) had 46 patients, representing 30.7% of the patients. Lastly, 9.3% (14) of the patients were over 75 years.

**Table 2: Gender Classification of the Patients**

Gender	Number of Patients	Percentage (%)
Male	58	38.7%
Female	92	61.3%



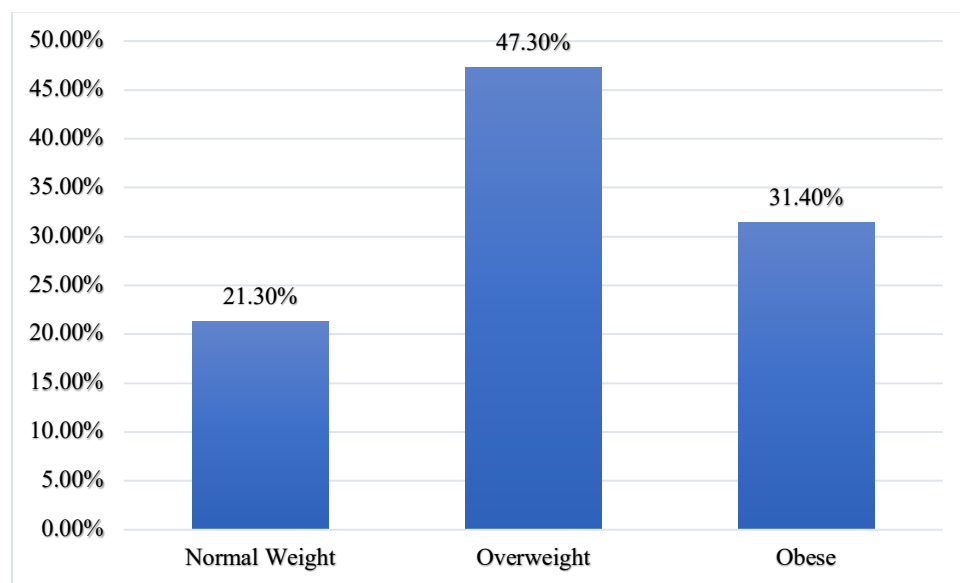
**Figure 2: Visual Representation of Gender Distribution of Patients**

Among the total number of 150 people involved in the research, the females were 92 (61.3%), while the number of males was 58 (38.7%). Consequently, this indicated that there were more

females suffering from the disorder than men. The causes contributing to this phenomenon could be the problems with hormonal balance, bone diseases in post-menopausal women, as well as obesity.

**Table 3: Distribution Based on Body Mass Index (BMI)**

BMI Category	Number of Patients	Percentage (%)
Normal Weight	32	21.3%
Overweight	71	47.3%
Obese	47	31.4%



**Figure 3: Visual Representation of Distribution According to Body Mass Index (BMI)**

The largest proportion of the subjects was overweight, at 71 (47.3%), while 47 (31.4%) of them were obese. Normal body weight was found only in 32 (21.3%) of the patients examined. The results obtained showed a clear correlation between

high body mass index and the development of advanced knee osteoarthritis. Overweight might create mechanical stress for the joints, leading to faster degeneration of the joints.

**Table 4: Knee Society Score (KSS) before and after the Procedure**

Parameter	Mean ± SD	p-value
Preoperative KSS	42.6 ± 8.4	<0.001
Postoperative KSS (12 Months)	84.9 ± 7.2	<0.001

The pre-operative scores on the Knee Society scale ranged from  $42.6 \pm 8.4$ , and a marked increase up to  $84.9 \pm 7.2$  within 12 months of surgery was noted. This increase was highly significant ( $p <$

0.001), demonstrating marked improvement in functional capacity and reduction of pain for the knees of the subjects.

**Table 5: Range of Motion before and after the Surgical Treatment**

Range of Motion	Mean $\pm$ SD	p-value
Preoperative	$78.4^\circ \pm 12.5^\circ$	<0.001
Postoperative (12 Months)	$112.6^\circ \pm 10.3^\circ$	<0.001

Average preoperative flexion of motion of the knee joint was found to be  $78.4^\circ \pm 12.5^\circ$ , whereas the postoperative average value rose to  $112.6^\circ \pm 10.3^\circ$ , representing a highly significant change with a

statistical significance of  $p < 0.001$ . It is therefore clear that the process of total knee replacement was able to restore the movement of the knee joint.

**Table 6: Improvement in Pain following Total Knee Replacement**

Pain Assessment	Number of Patients	Percentage (%)
Excellent Relief	88	58.7%
Good Relief	46	30.7%
Moderate Relief	12	8.0%
Poor Relief	4	2.6%

Patients who had excellent pain relief included 88 subjects (58.7%). Good pain relief occurred in 46 subjects (30.7%). Only 4 subjects (2.6%) suffered from poor pain relief after undergoing surgical treatment. It was found that knee replacement

surgery was very successful in alleviating knee pain caused by osteoarthritis. Postoperative pain relief had a great impact on patients' satisfaction levels.

**Table 7: Postoperative Functional Outcome**

Functional Outcome	Number of Patients	Percentage (%)
Excellent	74	49.3%
Good	52	34.7%
Fair	18	12.0%
Poor	6	4.0%

A great functional outcome was noted in 74 patients, representing 49.3% of the sample, while 34.7% of the sample reported good functional outcome, which represented 52 patients. Only 6

patients (4.0%) experienced poor functional outcome after surgery. It means that majority of the patients had achieved excellent functional recovery after the total knee replacement.

**Table 8: Postoperative Complications among Patients**

Complication	Number of Patients	Percentage (%)
Infection	5	3.3%
Knee Stiffness	8	5.3%
Deep Vein Thrombosis	2	1.3%
Persistent Pain	6	4.0%
No Complications	129	86.1%

Postoperative stiffness of the knee joint was the most frequently reported complication in 8 patients (5.3%), after which there were complaints about the presence of pain in 6 patients (4.0%). Five patients (3.3%) experienced infections, and only 2 patients (1.3%) had deep vein thrombosis. On the other hand, 129 patients (86.1%) experienced no complications after surgery. The results indicated that total knee replacement is a relatively safe surgical procedure with low risk of complications.

Functional assessment after total knee replacement was carried out in the present study and revealed considerable functional improvement in terms of Knee Society Score, knee ROM, pain relief, and general mobility of osteoarthritis patients. According to the results, the mean value of Knee Society Score was considerably improved from  $42.6 \pm 8.4$  before surgery to  $84.9 \pm 7.2$  after surgery, which indicated great recovery after the surgery. The same pattern was found in a study by F Xie (2010) [15] who reported a significant

## Discussion

functional improvement and improvement in QoL among osteoarthritis patients following total knee replacement surgery. Also, similar findings were made by R Gandhi et al. (2010) [16], whose study proved the efficiency of knee arthroplasty for achieving greater functional outcomes and patient mobility. Therefore, the results of the present study were congruent with those obtained previously.

Another important finding of the current study involved postoperative improvement in knee ROM and pain relief after surgery. It is worth noting that the knee ROM has been considerably increased to  $112.6^\circ \pm 10.3^\circ$  from  $78.4^\circ \pm 12.5^\circ$  before surgery. What is more, pain relief was observed among 134 osteoarthritis patients (89.4%), which is rather impressive. CD Liao et al. (2015) [17] in their study provided evidence for a substantial positive impact of postoperative rehabilitation and balance training on mobility, stability, and physical performance of osteoarthritis patients after surgery. Also, CD Liao et al.'s randomized controlled trial (2013) [18] found that postoperative balance training was helpful in enhancing mobility and functional abilities. Similarly, JE Stevens-Lapsley et al. (2011) [19] stated that considerable pain relief and improved functional activity were noted after total knee arthroplasty.

Postoperative complications did not occur often (86.1% of participants remained complication-free during the follow-up period), the most common being knee stiffness (5.3%). A number of infections and deep vein thromboses were also recorded. Most patients reported an excellent or good functional outcome. Consistent results have been obtained in a study by A Judge et al. (2012) [20] who stated that most of the patients experienced satisfactory outcomes following total knee replacement surgery, however, certain complications including obesity affected postoperative recovery. Also, R Becker et al. stated that patient satisfaction and functional recovery could be enhanced through successful postoperative pain relief and enhanced mobility.

### Conclusion

Overall, the results of this study indicate that the efficiency of total knee replacement surgery can be quite high when it comes to obtaining improved functionality among those suffering from knee osteoarthritis. It becomes clear that there has been a great deal of improvement in regards to such measures as Knee Society Score, range of motion, pain, and overall mobility of the patients. It becomes clear that most patients have had excellent/good results in terms of their functional status, as well as pain reduction and improved ability to undertake daily activities. There have been many females and obese patients among the sample population.

### References

Kumar *et al.*

1. Shan, L., Shan, B., Suzuki, A., Nouh, F., & Saxena, A. (2015). Intermediate and long-term quality of life after total knee replacement: a systematic review and meta-analysis. *JBJS*, 97(2), 156-168.
2. Gossec, L., Paternotte, S., Maillefert, J. F., Combesse, C., Conaghan, P. G., Davis, A. M., ... & Dougados, M. (2011). The role of pain and functional impairment in the decision to recommend total joint replacement in hip and knee osteoarthritis: an international cross-sectional study of 1909 patients. Report of the OARSI-OMERACT Task Force on total joint replacement. *Osteoarthritis and cartilage*, 19(2), 147-154.
3. Pearse, A. J., Hooper, G. J., Rothwell, A., & Frampton, C. (2010). Survival and functional outcome after revision of a unicompartmental to a total knee replacement: the New Zealand National Joint Registry. *The Journal of Bone & Joint Surgery British Volume*, 92(4), 508-512.
4. Carli, F., Clemente, A., Asenjo, J. F., Kim, D. J., Mistraletti, G., Gomarasca, M., ... & Tanzer, M. (2010). Analgesia and functional outcome after total knee arthroplasty: periarticular infiltration vs continuous femoral nerve block. *British journal of anaesthesia*, 105(2), 185-195.
5. Zeni Jr, J. A., Axe, M. J., & Snyder-Mackler, L. (2010). Clinical predictors of elective total joint replacement in persons with end-stage knee osteoarthritis. *BMC musculoskeletal disorders*, 11(1), 86.
6. Mizner, R. L., Petterson, S. C., Clements, K. E., Zeni Jr, J. A., Irrgang, J. J., & Snyder-Mackler, L. (2011). Measuring functional improvement after total knee arthroplasty requires both performance-based and patient-report assessments: a longitudinal analysis of outcomes. *The Journal of arthroplasty*, 26(5), 728-737.
7. Baker, P., Petheram, T., Jameson, S., Reed, M., Gregg, P., & Deehan, D. (2012). The association between body mass index and the outcomes of total knee arthroplasty. *JBJS*, 94(16), 1501-1508.
8. Bade, M. J., Kohrt, W. M., & Stevens-Lapsley, J. E. (2010). Outcomes before and after total knee arthroplasty compared to healthy adults. *Journal of orthopaedic & sports physical therapy*, 40(9), 559-567.
9. Aggarwal, A. K., Shashikanth, V. S., & Marwaha, N. (2014). Platelet-rich plasma prevents blood loss and pain and enhances early functional outcome after total knee arthroplasty: a prospective randomised controlled study. *International orthopaedics*, 38(2), 387-395.

10. Wood, A. M., Keenan, A. C., Arthur, C. H., Aitken, S. A., Walmsley, P., & Brenkel, I. J. (2013). The functional outcome of total knee replacements in young patients: A 10-year matched case control study. *Open Journal of Orthopedics*, 3(2), 128-132.
11. Elmallah, R. D., Cherian, J. J., Robinson, K., Harwin, S. F., & Mont, M. A. (2015). The effect of comorbidities on outcomes following total knee arthroplasty. *The journal of knee surgery*, 28(05), 411-416.
12. Ayers, D. C., Franklin, P. D., & Ring, D. C. (2013). The role of emotional health in functional outcomes after orthopaedic surgery: extending the biopsychosocial model to orthopaedics: AOA critical issues. *JBJS*, 95(21), e165.
13. Canovas, F., & Dagneaux, L. (2018). Quality of life after total knee arthroplasty. *Orthopaedics & Traumatology: Surgery & Research*, 104(1), S41-S46.
14. Vanlommel, L., Vanlommel, J., Claes, S., & Bellemans, J. (2013). Slight undercorrection following total knee arthroplasty results in superior clinical outcomes in varus knees. *Knee surgery, sports traumatology, arthroscopy*, 21(10), 2325-2330.
15. Xie, F., Lo, N. N., Pullenayegum, E. M., Tarride, J. E., O'Reilly, D. J., Goeree, R., & Lee, H. P. (2010). Evaluation of health outcomes in osteoarthritis patients after total knee replacement: a two-year follow-up. *Health and quality of life outcomes*, 8(1), 87.
16. Gandhi, R., Dhotar, H., Razak, F., Tso, P., Davey, J. R., & Mahomed, N. N. (2010). Predicting the longer term outcomes of total knee arthroplasty. *The Knee*, 17(1), 15-18.
17. Liao, C. D., Lin, L. F., Huang, Y. C., Huang, S. W., Chou, L. C., & Liou, T. H. (2015). Functional outcomes of outpatient balance training following total knee replacement in patients with knee osteoarthritis: a randomized controlled trial. *Clinical rehabilitation*, 29(9), 855-867.
18. Liao, C. D., Liou, T. H., Huang, Y. Y., & Huang, Y. C. (2013). Effects of balance training on functional outcome after total knee replacement in patients with knee osteoarthritis: a randomized controlled trial. *Clinical rehabilitation*, 27(8), 697-709.
19. Stevens-Lapsley, J. E., Schenkman, M. L., & Dayton, M. R. (2011). Comparison of self-reported knee injury and osteoarthritis outcome score to performance measures in patients after total knee arthroplasty. *PM&R*, 3(6), 541-549.
20. Judge, A., Arden, N. K., Cooper, C., Kassim Javaid, M., Carr, A. J., Field, R. E., & Dieppe, P. A. (2012). Predictors of outcomes of total knee replacement surgery. *Rheumatology*, 51(10), 1804-1813.