The Use of Scoring Systems in Knee Arthroplasty: A Systematic Review of the Literature

Background

The primary purpose of this systematic review was to clarify and quantify scoring system utilisation in knee arthroplasty literature. Additionally, the study considered the frequency and relationship of score use in papers published across a range of orthopaedic journals, and the influence of study design, level of evidence (LOE), primary research topic, and study country of origin on the scoring system employed.

Methods

A systematic search of eight electronic databases was performed to identify publications of clinical studies involving knee arthroplasty, in which a scoring system was used to assess patient outcomes.

Results

Of the 1,994 unique publications identified, 438 met the selection criteria. Identified articles reported a total of 86 scoring systems, 5 of which were reported in greater than 10.0% of included studies. The 1989 Knee Society Score (KSS) was markedly the most utilised scoring system (58.7%). Use of the KSS was significantly associated with orthopaedic journal impact factor (IF) ($p = 0.001$), with greater use demonstrated in journals of lower IF. Use of the WOMAC escalated with increasing IF, however no statistically significant association was observed. A preference for scoring systems developed in the country of residence of the first author was also identified.

Conclusions

A large number of scoring systems are used to assess knee arthroplasty patients, however 5 scores are consistently reported. By identifying and quantifying scoring system use, this review hopes to stimulate regularity in score usage to allow for improvements in comparability of clinician and patient reported outcomes in the knee arthroplasty literature.

Key Words

Knee Arthroplasty; Knee Replacement; Scoring System; Score; Patient reported outcome measure; Questionnaire

Introduction

Knee arthroplasty is an increasingly common surgical intervention used to alleviate pain and physical dysfunction associated with end-stage degenerative joint disease [1]. Advances in prosthesis design and surgical techniques have been accompanied by an increase in research, and the proliferation of scoring systems aimed to assess patient outcomes following knee arthroplasty.

Traditionally outcomes of knee arthroplasty were defined objectively by prosthesis survivorship, complications, or clinician-based assessments [2, 3]. More recently, there has been an emphasis on patients' perception of surgical success and consequently increased development of patient reported outcome measures (PROMs) [3]. Limits of both clinician-administered and PROMs have been recognised, highlighting the importance of both objective and subjective assessments of the knee following surgery [3, 4].

Typically, scoring systems assess a range of outcomes including pain levels, function, patient satisfaction, activity levels, overall health, and psychological state. Depending on focus, scoring systems have also been classified as disease-specific, joint (knee)-specific, and generic health measures [5, 6]. When evaluating patient outcomes following surgery, the inclusion of both specific and generic measures has been advised [5].

A plethora of scoring systems of varying degrees of validity, reliability, translatability, and responsiveness are currently reported in the knee arthroplasty literature [2, 7]. The abundance of scoring systems available has led to considerable variations in score utilisation [7, 8].

Lack of consensus in score usage compromises the ability to generalise results of new research to historical controls, and research addressing similar constructs [9]. Qualities of different prostheses, surgical interventions, and non-surgical factors in knee arthroplasty are difficult to compare meaningfully when diverse outcome measures, administration schedules and levels of follow-up have been employed.

In order to address variations in score usage we must first quantify current trends. Existing reviews have either summarised scoring systems available or tested the psychometric properties of a select few [9]. Dowsey et al. reviewed the strengths and weaknesses of four knee-specific scoring systems, while Davies reported a summary of ten scores available for assessment following total knee arthroplasty [7, 10]. Riddle et al. identified outcome measures systematically, however only those used in randomised knee trials of greater than or

equal to 6 weeks follow-up were included [8]. A systematic review by Drake et al. assessed the use of all outcomes measured across the orthopaedic knee literature, however the review was limited to publications between 1972-1992 [11].

Continued growth in score development highlights the need for a systematic review of the knee arthroplasty literature which is inclusive of all scoring systems in use, devoid of study design limits, and with consideration of additional factors motivating score choice.

A recent publication concluded that orthopaedic journals of higher impact factor were more likely to publish articles of level I or II evidence [12]. Such articles are, in theory, of higher value as the findings presented are based on a more rigorous study design. This raises the question of whether particular scoring systems were favoured in different research designs. Similarly, it queried whether the scoring system of choice was influenced by target journal, or inversely, whether the score chosen affected journal publication.

Variation in outcome measures have been observed across different research topics. Riddle et al. identified discrepancies in scores employed in randomised trials assessing surgical and non-surgical interventions for knee arthroplasty [8]. Knowledge of which scores are being used for specific topics is necessary to achieve consistency across score usage. Further study into which scores are used to measure specific Operative and Non-Operative research topics would also allow for more meaningful comparisons to historical controls.

By exploring the range of factors which may influence score choice, we aimed not only to increase awareness of available scores, but to motivate for greater uniformity in assessment tools chosen in future research to allow for more meaningful comparisons between studies and over time.

The primary objective of this systematic review was to *quantify scoring system utilisation by frequency of use, in knee arthroplasty literature.* Additionally, we aimed to assess auxiliary factors which may influence the choice of score. The secondary objective was to *identify associations between scoring system utilisation and impact factor of orthopaedic journals, study designs, levels of evidence (LOE), study research topics and study country of origin.*

Materials and Methods

The protocol for this systematic review was registered on PROSPERO (Registration Number CRD42014014775) and performed on the basis of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [13].

Search Strategy

A systematic search of eight electronic databases was performed on December 19 and 20, 2013. Databases searched included: OvidSP Medline, Pubmed, CINAHL, Embase, Cochrane Library, Scopus, PEDro and Web of Science.

The search strategy was created in collaboration with a senior medical librarian and first applied to the OvidSP Medline database (see Appendix A). The search was limited to studies in humans, articles written in English, and published in 2013. Grey literature was not sought as unpublished clinical trials were ineligible for inclusion.

Eligibility/Selection Criteria

Two authors selected the publications for inclusion in the review. Eligibility for inclusion was based on reviews of the title, abstract, and when indicated, a review of the full text. Publications were selected in accordance with the following criteria: (1) published clinical study involving knee arthroplasty; (2) a LOE -I, II, III, IV or V; (3) 2013 online or journal publication date (4) a scoring system was used to assess the patient pre- or post-knee arthroplasty. Single Likert scales alone were not considered sufficient for classification as a scoring system, however scale use was documented when measured in conjunction with a scoring system(s). Publications excluded were non-English articles, review articles, score or methodology validation studies and conference abstracts. Any disagreement between authors was further deliberated until consensus was reached.

Quality Assessment

LOE was used to rank study quality. A critical appraisal was not undertaken as score use in publications of all qualities was of interest, and outcome data was not extracted for further analysis and interpretation.

LOE for each publication was assigned in accordance with criteria outlined by *The Journal of Bone and Joint Surgery* (American Volume) (JBJS-A) [14]. In circumstances where the LOE was previously assigned, an author re-assessed, and where necessary, reassigned the LOE to ensure consistency across publications included in the review.

Data Extraction

A single author independently extracted the data from eligible publications on a standardised electronic spreadsheet. Data extracted included publishing journal, LOE, study type, study design, and scoring system. Sub-scores were identified as individual scoring systems and did not contribute to the use frequency of the complete scoring system. Revised and short-form scores also were considered as unique scoring systems.

Study design was classified in accordance JBJS-A LOE hierarchy [14]. Although not specified in the JBJS-A guidelines, case report study designs were classified as LOE Level 5. The country of origin of the first author and the primary research topic of each paper were also collected. Research topics were categorised under Operative and Non-Operative areas such as surgical technique or rehabilitation (see Appendix A).

Journal impact factors (IF) were sourced from the *2013 Journal Citation Report (JCR)* ISI Web of Science [15]. IF, first described by Dr Eugene Garfield [16], is the average frequency with which an article from the journal, in the preceding 2 years, has been cited in the JCR year [15]. It has been used as a measure to quantify and rank journal quality, despite recognised limitations in the calculation method [17].

IFs have been shown to vary significantly across subject fields [18], limiting the validity of comparing across disciplines [17]. As such, only articles published in journals categorised under the Orthopaedics subject category of the 2013 JCR were compared. IF for the Orthopaedics subject category ranged from 0.156 to 4.699 in the 2013 report.

In this review, journal IF was classified as low, medium, high, and very high according to the following parameters: low (IF < 1); medium (IF 1 – 1.999); high (IF 2 – 2.999); very high (IF ≥ 3).

Data Analysis

All analyses were conducted with Stata 13.1 (StataCorp, USA) statistical software package. Utilisation of a scoring system was presented as a percentage of the total number of articles which used that score. The top 5 utilised scoring systems were then considered for further analysis.

The use of multiple scores in combination was measured using the Kappa Test. The kappa value (κ) determined whether specific scoring systems were paired more frequently than expected by chance (50.0%).

We examined the frequency with which different scoring systems were reported in various orthopaedic journals. A Fisher's exact test was conducted to determine the association of score utilisation in orthopaedic journals with low to very high IFs. The Fisher's exact test was also used to examine the association between score usage and the study designs of the therapeutic study type and LOE.

For primary research topics investigated by more than ten articles, we tested the association between the score usage and the primary research topic within each study area (Operative and Non-Operative) using the Fisher's exact test.

Score utilisation by study country origin was also assessed using Fisher's exact test. The association between the top 5 utilised scoring systems and top 5 publishing countries was examined. For all association tests, a P-value (*p)* of less than 0.05 was considered statistically significant.

Results

Literature Search

The search strategy identified a total of 1,994 unique publications. Following initial abstract screening, 572 articles were retrieved for full-text assessment, of which 438 publications met the selection criteria (Fig. 1).

Scoring Systems

Identified articles reported a total of 86 scoring systems, comprising 80 unique scoring systems and 6 sub-scores. The most frequently reported scoring system was the knee specific, 1989 Knee Society Score (KSS), utilised in 59% of included articles. Fig. 2 depicts the 10 most reported scoring systems, the remaining 76 scores were each used in fewer than 2% of included articles ($\leq$ 8 articles each).

A list of all scoring systems, categorised according to the score primary measure is provided (see Appendix B). Six categories were considered further with the most frequently utilised scoring system reported for each (Table I).

The KSS, Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), Oxford Knee Score (OKS), Visual Analogue Scale for Pain (VAS – P) and Short-Form 36 (SF – 36) were identified as the top 5 reported scoring systems.

Of these top 5 scores the WOMAC was found to be more frequently paired with the VAS – P ($\kappa = 0.08$, $p = 0.04$) and the SF–36 ($\kappa = 0.09$, $p = 0.04$) than expected by chance. The SF – 36 was also more frequently paired with the OKS ($\kappa = 0.14$, $p = 0.002$). No significant pairings were found between the KSS and the WOMAC, VAS – P, SF – 36 or OKS.

Orthopaedic Journals by IF

Included articles were published across 106 distinct journals. This was comprised of 29 JCR classified orthopaedic journals, 28 of which had a recorded IF. Of the 438 articles, 71.7% were published in an orthopaedic journal.

Use of the KSS was significantly associated with Journal IF ($p = 0.001$). Journals of very high IF utilised the KSS in 25.0% of publications in contrast to ≥ 66.1% of publications in journals with an IF of less than 3 (Table II) (Fig. 3).

As visually illustrated in Fig. 3, use of the WOMAC appeared to escalate with increasing IF, however no statistically significant association was observed (Table II).

Study Designs

A large proportion (89%) of articles were of a therapeutic study type. Analysis revealed a significant association between the VAS – P and study design of the therapeutic study type ($p < 0.001$). It was found that the VAS – P was most commonly used in randomised controlled trial (RCT) study designs. No further significant associations were observed (Table III).

Level of Evidence

There was no significant association between scoring system utilisation and the LOE, except for the VAS – P which was more likely to be used in studies of higher LOE ($p < 0.001$) (Table IV).

Primary Research Topic

Included articles considered 15 primary research topics, broadly classified into two classes; Operative and Non-Operative.

Utilization of the KSS and VAS – P were significantly associated with Operative research topics ($p < 0.005$, $p < 0.001$, respectively). It was found that the KSS was more commonly used in articles considering surgical technique, approach, and implant, as opposed to anaesthetic/analgesic investigations. Conversely, the VAS – P was utilised in 65% of anaesthetic/analgesic studies compared to ≤ 42% of other topics (Table V).

There was no significant association between scoring system utilization and Non-Operative research topics, with the exception of SF–36, which was more likely to be used in rehabilitative studies or those considering the influence of patient characteristics on TKA ($p < 0.005$).

Study Country Origin

The top 5 publishing countries were the United States of America (USA), the United Kingdom (UK), South Korea, Canada and Australia. Together, these countries contributed 50% of the articles included in this study.

The KSS, WOMAC and OKS were significantly associated with the study country of origin of the article ($p = 0.005$, $p < 0.001$ and $p < 0.001$, respectively). The KSS was utilised in more than 52.4% of publications originating from the USA, South Korea and Australia, however less frequently in publications from the UK or Canada (Table VI). Conversely, 71% of Canadian publications utilised the WOMAC and 71% of British publications reported the OKS. Both scores were not utilised to the same extent in articles from the remaining 4 countries.

Discussion

A large number of scoring systems (86) were identified in the knee arthroplasty literature. However, only 5 scoring systems were reported consistently in more than 10% of selected studies.

The 1989 KSS was markedly the most utilised scoring system, a finding accordant with existing reviews. Drake et al. [11] identified 34 different scores while Riddle et al. [8] assessed score use in randomised knee trials and both reported the KSS as most widely used. Psychometric deficiencies of this 1989 KSS have been recognised [19], and a revised, validated Knee Society Score (2011) made available [20]. Nevertheless, the original KSS remains widely adopted, highlighting that the shift is yet to be made to a more psychometrically sound scoring system. Delay between the initiation and completion of long-term studies, instigated before such evidence was available, may have contributed to continued use.

Psychometric and administrative properties of the subsequent 4 top scores have been studied to varying degrees. In knee osteoarthritic patients, the WOMAC has demonstrated adequate internal consistency and good face, content and construct validity [21]. However, variable rates of test-retest reliability have been reported [21]. The OKS is a 12-item patient reported outcome measure aimed to assess knee pain and function after TKA [22]. This score has demonstrated internal consistency, test-retest reliability and construct validity, as well as adequate levels of responsiveness to clinical change [21-24]. The SF – 36 is a generic health measure that has demonstrated adequate internal consistency and construct validity, however unsatisfactory content validity [2]. The WOMAC, OKS and SF – 36 are estimated to require 5 to 10 minutes to complete [2, 21]. The VAS – P is a unidimensional measure of pain [25]. The respondent burden is estimated at 1 minute or less and acceptable responsiveness, validity and test-retest reliability has been demonstrated in various populations [25].

In the present review scoring systems were also considered in regards to score primary measure. Previous literature suggested the use of both disease-specific and generic measures for a complete assessment of surgical treatment [6]. The findings demonstrated significant pairings between the use of the disease-specific WOMAC and OKS, and the generic SF–36, highlighting the use of both measures as advocated.

Significant differences were identified in scoring systems employed across orthopaedic journals of varying IFs. Very high IF journals, such as *JBJS-Am (4.309)* and *Osteoarthritis and Cartilage (4.663),* more commonly contained publications using the disease-specific measure, the WOMAC. Conversely, the KSS was more likely utilised in publications from journals of high, medium and low IF, such as the *Journal of Arthroplasty (2.369)* and *Knee (1.702)*. Grounds for such discrepancies may be due to score recommendations provided by the journal, or they may be a reflection of the focus of the paper or of the speciality of the journal.

Study Design, LOE and Study Research Topics

Findings revealed that the VAS – P was most commonly used in RCTs and, accordingly, studies of level-1 evidence. RCTs are referred to as the gold standard of evidence-based medicine and are a design viable when comparing pharmaceutical interventions [26]. Pharmaceutical RCTs do not encounter the ethical barriers to the extent faced in surgical trials, making them a practical option for anaesthetic/analgesic investigations [26]. The VAS – P was also most frequently utilised in anaesthetic/analgesic studies.

Riddle et al. considered variation in score usage and found the KSS used most commonly in studies investigating surgical interventions [8]. In the present review, the KSS was also found most commonly in operative-focused papers, but more specifically, studies investigating surgical technique, approach, and knee prosthesis.

Study Country of Origin

Of the top 5 publishing countries it was found authors tended toward the use of scores developed in their home country. Canadian publications displayed a preference for reporting the Canadian measure, the WOMAC, while USA publications reported the KSS most frequently. Similarly, articles published from the UK most commonly reported the OKS, highlighting this trend between publication origin and score use by country.

Through this review, inconsistencies across scoring system nomenclature became apparent. Terminology used to describe a single score varied from article to article, with the potential to cause errors in interpretation for the reader. We stress that the score reference be consulted to

avoid inaccurate interpretation of results, particularly when comparisons across papers are made.

The need for a single reference outlining scoring systems also became evident. As such, a comprehensive list of scores in use, in accordance with each score's primary measure is provided (see Appendix B). By providing this single reference of the many scores available we hope to assist researchers in making a more informed decision when selecting a scoring system.

The strengths of this review were that a large number of articles (438) from a diversity of journals (106) and countries were reviewed in order to clearly quantify scoring system use in knee arthroplasty literature. Discerned for existing literature, this review systematically identified the scores in use and explored associations for a range of variables influencing score choice, without restriction on study quality. This review also had several limitations. Each reviewer did not assess all articles included, and the sample was restricted to English-language publications. The literature search was limited to 1 year, potentially causing less commonly used scores to be overlooked.

In conclusion, a large number of scoring systems (86) are used to assess knee arthroplasty patients, however only 5 are consistently reported. Associations were observed between scoring systems and orthopaedic journals of varying IF, as well as the RCT study design and specific research topics. A preference for scoring systems developed in the country of residence of the first author was also identified.

We acknowledge that consistency in score usage across the literature is paramount, however score prevalence should not provide the only basis for further use. By identifying and quantifying scoring systems in use, we aim to enable researchers and clinicians to make a more informed decision when selecting a scoring system.

We recommend that future research in the outcomes of knee arthroplasty seek to standardise a core set of psychometrically sound, generic and specific scoring systems in order stimulate regularity in score usage, improve comparability and allow a thorough assessment of knee arthroplasty patients.

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Tables

TABLE I – Scoring System Utilisation by Score Category

Scoring System Categories	*Most Reported Scoring Systems**
Knee Specific Outcome Measures	1989 Knee Society Score (57.3%)
Disease Specific Outcome Measures	WOMAC (23.7%)
Quality of Life Measures	Short Form – 36 (13.9%)
Functional or Activity Measures	UCLA Activity Scale (3.0%)
Patellafemoral Measures	Feller Patella Score (1.4%)
Pain Measures	VAS – P (14.2%)

UCLA – University of California, Los Angeles Activity Scale

VAS – P – Visual Analogue Scale for Pain

WOMAC - Western Ontario and McMaster Universities Osteoarthritis Index

* is the percentage (%) of score use across all included articles (n = 438)

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TABLE II – Scoring System use across Orthopaedic Journal Impact Factor (IF) Category*

	KSS	WOMAC	OKS	VAS – P	SF-36
Low IF	**40**	6	15	8	6
($n_{j = 8}$, $n_{a = 37}$)	**(70.2%)**	(10.5%)	(26.3%)	(14.0%)	(10.5%)
Medium IF	37	18	13	6	6
($n_{j = 9}$, $n_{a = 56}$)	(66.1%)	(17.9%)	(23.2%)	(10.7%)	(10.7%)
High IF	124	51	35	30	28
($n_{j = 9}$, $n_{a = 185}$)	(67.0%)	(28.0%)	(18.9%)	(16.2)	(15.1%)
Very High IF	4	**6**	3	0	3
($n_{j = 2}$, $n_{a = 16}$)	(25.0%)	**(37.5%)**	(18.8%)	(0.0%)	(18.8%)
p-value	**0.009**	**0.015**	0.631	0.307	0.660

Orthopaedic Journals by IF Category (see Appendix A): Low (IF < 1); Medium (IF 1 – 1.999); High (IF 2 – 2.999); Very High (IF ≥ 3).

*Values are the number of articles and percentage of articles in the IF group that reported the score.

n_j = Number of Orthopaedic Journals in category.

n_a = Number of articles in category of Orthopaedic Journal.

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TABLE III – Scoring System use across Study Designs of the Therapeutic Study Type*

Study Designs	KSS	WOMAC	OKS	VAS – P	SF-36
Randomised Controlled Trial	27 (54.0%)	14 (28.0%)	14 (28.0%)	**20 (40.0%)**	9 (18.0%)
Lesser Quality RCT	6 (66.7%)	2 (22.2%)	0 (0.0%)	2 (22.2%)	1 (11.1%)
Prospective Comparative Study	30 (56.6%)	13 (24.5%)	6 (11.3%)	13 (24.5%)	7 (13.2%)
Retrospective Comparative Study	49 (60.5%)	20 (24.7%)	20 (24.7%)	7 (8.6%)	9 (11.1%)
Case Control Series	12 (75%)	2 (12.5%)	3 (18.8%)	2 (12.5%)	2 (12.5%)
Case Series	109 (63.0%)	39 (22.5%)	32 (18.5%)	12 (6.9%)	17 (9.8%)
Case Report	4 (80.0%)	0 (0.0%)	1 (20.0)	0 (0.0%)	1 (20.0%)
p-value	0.766	0.595	0.265	**0.000**	0.267

*Values are the number of articles and percentage (%) of total articles of a study design that used the score.

RCT = Randomised Controlled Trial.

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TABLE IV – Scoring System Utilisation based on Level of Evidence*

Level of Evidence	KSS	WOMAC	OKS	VAS – P	SF-36
1	31 (53.5%)	17 (29.3%)	14 (24.1%)	21 (36.2%)	12 (20.7%)
2	48 (50.0%)	24 (25.0%)	13 (13.5%)	19 (19.8%)	17 (17.7%)
3	62 (61.4%)	23 (22.8%)	23 (22.8%)	10 (9.9%)	13 (12.9%)
4	112 (62.9%)	40 (22.5%)	33 (18.5%)	12 (6.7%)	18 (10.1%)
5	4 (80.0%)	0 (0.0%)	1 (20.0%)	0 (0.0%)	1 (20.0%)
p-value	0.189	0.669	0.368	**0.000**	0.157

* Values are the number of articles and percentage (%) of total articles of a level of evidence that used the score.

TABLE V – Scoring System Utilisation across Primary Research Topics*

	KSS	WOMAC	OKS	VAS – P	SF-36
Operative Topic					
Surgical Technique	80 (77.7%)	20 (19.4%)	21 (20.4%)	10 (9.7%)	9 (8.7%)
Implant	67 (70.5%)	23 (24.2%)	22 (23.2%)	6 (6.3%)	8 (8.4%)
Intraoperative Factors	13 (72.2%)	4 (22.2%)	2 (11.1%)	3 (16.7%)	1 (5.6%)
Anaesthetics/Analgesics	8 (40.0%)	5 (25.0%)	3 (15.0%)	13 (65.0%)	2 (10.0%)
Surgical Approaches	11 (91.7%)	3 (25.0%)	0 (0.0%)	5 (41.7%)	1 (8.3%)
p-value	**0.010**	0.902	0.710	**0.000**	0.940
Non-Operative Topic					
Outcomes after TKA	35 (40.2%)	16 (18.4%)	14 (16.1%)	10 (11.5%)	11 (12.6%)
Patient Characteristics affecting TKA	32 (48.5%)	20 (30.3%)	16 (24.4%)	9 (13.6%)	23 (34.9%)
Physiotherapy/Rehabilitation	1 (5.0%)	8 (40.0%)	3 (15.0%)	4 (20.0%)	5 (25.0%)
p-value	0.328	0.070	0.435	0.536	**0.004**

* Values are the number of articles and percentage (%) of total articles of a research topic that used the score.

Primary research topic investigated in < 10 articles were not analysed.

Research topics with < 10 articles included:

Operative topics: Arthrodesis, Platelet Rich Plasma, Tranexamic acid and Tendons and Ligaments.

Non-Operative topics: Economic Factors, Incidence of TKA, Outcomes of Previous Surgery on TKA.

See Appendix A for a detailed description of topic area classifications.

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TABLE VI – Scoring System Utilisation by Study Country of Origin*

	KSS	WOMAC	OKS	VAS – P	SF-36
USA	62 (66.7%)	14 (15.1%)	7 (7.5%)	7 (7.5%)	11 (11.8%)
UK	18 (37.5%)	10 (20.8%)	34 (70.8%)	2 (4.2%)	5 (10.4%)
South Korea	23 (67.7%)	14 (41.2%)	0 (0.0%)	5 (14.7%)	5 (14.7%)
Canada	10 (41.6%)	17 (70.8%)	8 (33.3%)	3 (12.5%)	5 (20.8%)
Australia	11 (52.4%)	8 (38.1)	4 (19.1%)	2 (9.5%)	4 (19.1%)
p – value	**0.005**	**0.000**	**0.000**	0.425	0.622

* Values are the number of articles and percentage (%) of total articles from the country that used the score.

USA = United States of America; UK = United Kingdom

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Legend

Figures

Figure 1

PRISMA 2009 Flow Diagram for Study Selection

Figure 2

Scoring System Utilisation

Footnotes:

KSS = Knee Society Score, WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index, OKS = Oxford Knee Score, VAS-P = Visual Analogue Scale for Pain, SF-36 = Short Form-36, HSS = Hospital for Special Surgeries Score, SF-12 = Short Form – 12, KOOS = Knee Injury and Osteoarthritis Outcome Score, EQ-5D = Euroqol 5 Dimensional, UCLA AS = University of California, Los Angeles Activity Scale

76 remaining scores were utilised in fewer than 2.0% of included articles (≤ 8 articles)

Figure 3

Scoring System Utilisation across Orthopaedic Journal Impact Factor (IF).

Footnotes:

Orthopaedic Journals by IF Category (see Appendix A)

Low (IF < 1); Medium (IF 1 – 1.999); High (IF 2 – 2.999); Very High (IF ≥ 3).

Tables

Table I

TABLE I – Scoring System Utilisation by Score Category

Footnotes:

UCLA – University of California, Los Angeles Activity Scale

VAS – P – Visual Analogue Scale for Pain

WOMAC - Western Ontario and McMaster Universities Osteoarthritis Index

* is the percentage (%) of score use across all included articles (*n* = 438)

Table II

TABLE II – Scoring System use across Orthopaedic Journal Impact Factor (IF) Category*

Footnotes:

Orthopaedic Journals by IF Category (see Appendix A): Low (IF < 1); Medium (IF 1 – 1.999); High (IF 2 – 2.999); Very High (IF ≥ 3).

*Values are the number of articles and percentage of articles in the IF group that reported the score.

n_j = Number of Orthopaedic Journals in category.

n_a = Number of articles in category of Orthopaedic Journal.

Table III

TABLE III – Scoring System use across Study Designs of the Therapeutic Study Type*

Footnotes:

*Values are the number of articles and percentage (%) of total articles of a study design that used the score.

RCT = Randomised Controlled Trial.

Table IV

TABLE IV – Scoring System Utilisation based on Level of Evidence*

Footnotes:

* Values are the number of articles and percentage (%) of total articles of a level of evidence that used the score.

Table V

TABLE V - Scoring System Utilisation across Primary Research Topics*

Footnotes:

* Values are the number of articles and percentage (%) of total articles of a research topic that used the score.

Primary research topic investigated in < 10 articles were not analysed.

Research topics with < 10 articles included:

Operative topics: Arthrodesis, Platelet Rich Plasma, Tranexamic acid and Tendons and Ligaments.

Non-Operative topics: Economic Factors, Incidence of TKA, Outcomes of Previous Surgery on TKA.

See Appendix A for a detailed description of topic area classifications.

Table VI

TABLE VI – Scoring System Utilisation by Study Country of Origin

Footnotes:

* Values are the number of articles and percentage (%) of total articles from the country that used the score.

USA = United States of America; UK = United Kingdom

Appendix A

TABLE I Ovid MEDLINE Search Strategy

MeSH Terms	Free Text Terms
Arthroplasty, Replacement, Knee/	Measure*
Knee Prosthesis/	Instrument*
(Knee and (replacement or arthroplasty)).mp.	Scale*
Osteoarthritis, Knee/su [Surgery]	Index*
Knee joint/ or Knee/) and Arthroplasty/	Indice*
"Outcome Assessment (Health Care)"/	Rating
Health Status Indicators/	Assessment*
Questionnaires/	Patient Report*
Self Report/	Tool*
"Quality of Life"/	Questionnaire*
Follow-Up Studies/	Indicator*

/ MeSH/Subheading combination

* Search Term Truncation

TABLE II Research Topic Categories

	Operative	
ST	**Surgical Technique**	
	CAS, MIS, PSI, Uni- Bi- Lateral TKA	Electro-magnetic Unicondylar TKA
	Revision:	Infrapatella fat pad excision
	▪ Single, Staged (1 or 2)	Bone grafting
	▪ Simultaneous Vs bilateral	Gastrocnemius flap reconstruction
	▪ One stage long stem TKR	Quadriceps Sparing
	Fixation:	Modular augmentation
	▪ Cemented, Cementless	Tibio-Femoral Joint Distraction
	Constrained Vs Unconstrained	Patella Femoral Joint Replacement
	Spacer Vs tension guide technique	Patella Decompression
	Robotic assisted TKR	Patella Height
	Liner Exchange	Tibiofemoral Contact Point
	Posterior Condylar Offset	Manual lymphatic drainage post TKR
Implant	**Implant**	
	Spacers	Cement prostheses like spacer
	Intramedullary nail	High Flexion prosthesis
	Use of tantal cones	Metaphyseal sleeves
	Inserts	Patella resurfacing
	Tibial Implants	PE Tibial Inserts
	Metal block augmentation	Coated Vs Uncoated Implant
	Medial Lateral oversizing	Fixed Bearing
	PE Tibial Component	Mobile Bearing
	Medial Pivot TKR	Survivorship of Implant
	Endoprostheses	
SA	**Surgical Approaches**	
	Synovectomy, Parapatellar	Medial, Lateral approaches
	Medial subvastus	Quadricep snip
	minipore patella	Tibial Tubercle Osteotomy

TL	**Tendons and Ligaments**	
	Patella Tendon	Posterior Cruciate Ligament
IO	**Intraoperative Factors**	
	Gap Analysis Patella Eversion Alignment Posterior tibial slope Patella Denervation Anterior/Posterior Referencing	Gap Balancing Soft Tissue Balance Knee Kinematic Patterns Soft Tissue Release Vs Bony Resection Half Course Tourniquet Blood Loss
Ar	**Arthrodesis**	
	Non-Operative	
PS	**Outcomes of Previous Surgery on TKA**	
	High Tibial Osteotomy - Wedge Osteotomy - Medial, Lateral	Revision of Meniscal Transplants Meniscal Allograft Surgery Patellofemoral Arthroplasty
PT	**Physiotherapy/Rehabilitation**	
	Quadriceps weakness Home exercise programs Physical Function after TKR	Neuromuscular exercise Physical Therapy Rehabilitation Continuous passive motion exercise
PRP	**Platelet Rich Plasma**	
Tran	**Tranexamic Acid**	
IN	**Incidence of TKA**	
An	**Analgesia/Anaesthetics**	
	Spinal Anesthesia Peri-articular Steroid Injection NSAIDs	Single injection/continuous femoral nerve block

	Local infiltration versus epidural Continuous perineural fentanyl infusion Bupivacaine Milnacipran		Periarticular Injection or Intrathecal Morphine Multimodal Pain Management Multimodal cocktail periarticular injection with or without steroid
Ec	**Economic Factors**		
	Cost effectiveness of TKR		
O	**Outcomes after TKA**		
	Function Satisfaction Anxiety Thrombosis Pain Swelling PTSD Diabetes Hypertension Transfusion Femur Fracture Flexion contracture	Return to work Joint infection Joint Stability Knee Strength ROM Balance Stiff Knee Bone mineral density Hospital LOS Alignment Cam Impingement Dynamic Movement	Periprosthetic supracondylar femoral fractures Femoral Condylar fracture Patella femoral crepitus Contralateral knee pain Lateral Patella Facet Impingement Painful Patella Clunk Implant Migration (measured via RSA) Venous Thrombosis Embolism
PC	**Patient Characteristics affecting TKA**		
	Obesity/BMI Gender Age Ethnicity Jehovah's Witness Osteo Vs Rheumatoid arthritis Nocturnal pain Pain Physiological status Anxiety/Depression	Income Alcohol consumption Use of Biological Drugs Kashinbeck disease Parkinson's disease Inflammatory profile Bleeding disorders Haemophilia Tuberculous arthritis Synovial Fluid Leptin concentrations	Lumbar Spondylosis Lumbar Spinal Stenosis Amputee Arthritis in other compartments Distal Femoral Deformity Health care subsidy Disease of non-op treated joints Length of Patella tendon Lateral Femoral Bowing

Expectations	Pre-op flexion	Flexion contracture
Socio-Economic difference	Patella instability	Contralateral knee pain

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TABLE III Orthopaedic Journal by Impact Factor Category [15]	
Journal Impact Factor (IF)	*Journals (IF)*
Very High ≥ 3	Osteoarthritis and Cartilage (4.663)
	Journal of Bone and Joint Surgery - American Volume (4.309)
High 2 – 2.999	Journal of Orthopaedic Research (2.972)
	Clinical Orthopaedics and Related Research (2.882)
	Knee Surgery Sports Traumatology Arthroscopy (2.837)
	Journal of Bone and Joint Surgery - British Volume* (2.801)
	Injury - International Journal of the Care of the Injured (2.462)
	Acta Orthopaedica (2.452)
	Journal of Orthopaedic & Sports Physical Therapy (2.376)
	Journal of Arthroplasty (2.369)
	Gait and Posture (2.299)
	International Orthopaedics (2.019)
Medium 1 – 1.999	BMC Musculoskeletal Disorders (1.898)
	Clinical Biomechanics (1.880)
	Knee (1.702)
	Journal of Orthopaedic Trauma (1.540)
	Archives of Orthopaedic and Trauma Surgery (1.310)
	Orthopaedics & Traumatology-Surgery & Research (1.168)
	Prosthetics and Orthotics International (1.073)
	Journal of Back and Musculoskeletal Rehabilitation (1.041)

	Journal of Orthopaedic Science (1.008)
Low < 1	Orthopedics (0.977) Eklem Hastaliklari ve Cerrahisi-Joint Diseases and Related Surgery (0.634) Indian Journal of Orthopaedics (0.624) Acta Orthopaedica Belgica (0.567) Acta Orthopaedica et Traumatologica Turcica (0.554) Acta Chirurgiae Orthopaedicae et Traumatologiae Cechoslovaca (0.415) Acta Ortopedica Brasileira (0.156)

* In 2013 the Journal of Bone and Joint Surgery - British Volume (JBJS-Br) title has changed to Bone & Joint Journal with IF of 0.000. The IF of JBJS-Br was used for this review.

Appendix B – Scoring Systems used in the Knee Arthroplasty Literature

Knee Joint Scores

Acronym	Score
KSS	The Knee Society Score Also referenced as the: ▪ International Knee Society Score (IKS) ▪ American Knee Society Score (AKSS) **Insall JN, Dorr LD, Scott RD, Scott WN.** Rationale of the Knee Society clinical rating system. *Clin Orthop Relat Res 1989-248:13-4.*
KSS – 2011	The Knee Society Score – 2011 **Noble PC, Scuderi GR, Brekke AC, Sikorskii A, Benjamin JB, Lonner JH, Chadha P, Daylamani DA, Scott WN, Bourne RB.** Development of a new Knee Society scoring system. *Clin Orthop Relat Res 2012;470-1:20-32.*
OKS	Oxford Knee Score **Dawson J, Fitzpatrick R, Murray D, Carr A.** Questionnaire on the perceptions of patients about total knee replacement. *J Bone Joint Surg Br 1998;80-1:63-9.* **Murray DW, Fitzpatrick R, Rogers K, Pandit H, Beard DJ, Carr AJ, Dawson J.** The use of the Oxford hip and knee scores. J Bone Joint Surg Br 2007;89-8:1010-4.
KOOS	Knee Injury and Osteoarthritis Outcome Score **Roos EM, Roos HP, Lohmander LS, Ekdahl C, Beynnon BD.** Knee Injury and Osteoarthritis Outcome Score (KOOS)--development of a self-administered outcome measure. *J Orthop Sports Phys Ther 1998;28-2:88-96.*
IKDC Subjective Knee Form	International Knee Documentation Committee Subjective Knee Form Originating from the IKDC Standard Evaluation Form **Irrgang JJ, Anderson AF, Boland AL, Harner CD, Kurosaka M, Neyret P, Richmond JC, Shelborne KD.** Development and validation of the international knee documentation committee subjective knee form. *Am J Sports Med 2001;29-5:600-13.* **Hefti F, Muller W, Jakob RP, Staubli HU.** Evaluation of knee ligament injuries with the IKDC form. *Knee Surg Sports Traumatol Arthrosc 1993;1-3-4:226-34.*
HSS	Hospital for Special Surgery Score **Insall JN, Ranawat CS, Aglietti P, Shine J.** A comparison of four models of total knee-replacement prostheses. *J Bone Joint Surg Am 1976;58-6:754-65.*
	Mayo Knee Score **McGrory BJ, Morrey BF, Rand JA, Ilstrup DM.** Correlation of patient questionnaire responses and physician history in grading clinical outcome following hip and knee arthroplasty. A prospective study of 201 joint arthroplasties. *J Arthroplasty 1996;11-1:47-57.*

ISK	Index of Severity for Knee Disease Also referenced as the: ▪ Lequesne Knee Score ▪ Lequesne Algofunctional Score **Lequesne MG, Mery C, Samson M, Gerard P.** Indexes of severity for osteoarthritis of the hip and knee. Validation--value in comparison with other assessment tests. *Scand J Rheumatol Suppl 1987;65:85-9.*
FJS – 12	Forgotten Joint Score **Behrend H, Giesinger K, Giesinger JM, Kuster MS.** The "forgotten joint" as the ultimate goal in joint arthroplasty: validation of a new patient-reported outcome measure. *J Arthroplasty 2012;27-3:430-6 e1.*
TKFQ	Total Knee Function Questionnaire **Weiss JM, Noble PC, Conditt MA, Kohl HW, Roberts S, Cook KF, Gordon MJ, Mathis KB.** What functional activities are important to patients with knee replacements? *Clin Orthop Relat Res 2002-404:172-88.*

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608 **Disease Specific Scores/Scales**

WOMAC	The Western Ontario and McMaster Universities Osteoarthritis Index **Bellamy N, Buchanan WW, Goldsmith CH, Campbell J, Stitt LW.** Validation study of WOMAC: a health status instrument for measuring clinically important patient relevant outcomes to antirheumatic drug therapy in patients with osteoarthritis of the hip or knee. *J Rheumatol 1988;15-12:1833-40.*
JKOM	Japanese Knee Osteoarthritis Measurement **Akai M, Doi T, Fujino K, Iwaya T, Kurosawa H, Nasu T.** An outcome measure for Japanese people with knee osteoarthritis. *J Rheumatol 2005;32-8:1524-32.*
MSTS	Musculoskeletal Tumor Society Functional Rating Scale **Enneking WF, Dunham W, Gebhardt MC, Malawar M, Pritchard DJ.** A system for the functional evaluation of reconstructive procedures after surgical treatment of tumors of the musculoskeletal system. *Clin Orthop Relat Res 1993-286:241-6.*

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610 **Generic Health Status/Quality of Life Scores/Scales**

SF – 36	Short Form -36 **Ware JE, Jr., Sherbourne CD.** The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Med Care 1992;30-6:473-83.*
SF – 12	Short Form-12 **Ware J, Jr., Kosinski M, Keller SD.** A 12-Item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. *Med Care 1996;34-3:220-33.*
SF – 8	Short Form – 8 (as cited in Bost et al.)

	Bost JE, Williams BA, Bottegal MT, Dang Q, Rubio DM. The 8-item Short-Form Health Survey and the physical comfort composite score of the quality of recovery 40-item scale provide the most responsive assessments of pain, physical function, and mental function during the first 4 days after ambulatory knee surgery with regional anesthesia. *Anesth Analg 2007;105-6:1693-700, table of contents.*
VR – 12	Veterans Rand 12 Item Health Survey **Kazis LE, Selim A, Rogers W, Ren XS, Lee A, Miller DR.** Dissemination of methods and results from the veterans health study: final comments and implications for future monitoring strategies within and outside the veterans healthcare system. *J Ambul Care Manage 2006;29-4:310-9.*
EQ – 5D	Euroqol 5 Dimensional **Rabin R, de Charro F.** EQ-5D: a measure of health status from the EuroQol Group. *Ann Med 2001;33-5:337-43.*
QWB – 7	Quality of Well-being Index Total Score **Kaplan RM, Bush JW, Berry CC.** Health status: types of validity and the index of well-being. *Health Serv Res 1976;11-4:478-507.*
GROC	Global Rate of Change **Jaeschke R, Singer J, Guyatt GH.** Measurement of health status. Ascertaining the minimal clinically important difference. *Control Clin Trials 1989;10-4:407-15.*
SIP	Sickness Impact Profile **Bergner M, Bobbitt RA, Carter WB, Gilson BS.** The Sickness Impact Profile: development and final revision of a health status measure. *Med Care 1981;19-8:787-805.*
HAQ	Health Assessment Questionnaire **Fries JF.** Education for outcome. *J Rheumatol 1978;5-1:1-2.*
LLDI	Late Life Disability Index **Jette AM, Haley SM, Coster WJ, Kooyoomjian JT, Levenson S, Heeren T, Ashba J.** Late life function and disability instrument: I. Development and evaluation of the disability component. *J Gerontol A Biol Sci Med Sci 2002;57-4:M209-16.*

Economic Evaluation Score

SF – 6D	Short Form – 6 Dimensional **Brazier J, Roberts J, Deverill M.** The estimation of a preference-based measure of health from the SF-36. *J Health Econ 2002;21-2:271-92.*

Recovery Specific Scores

QoR40	Quality of Recovery – 40

	Myles PS, Hunt JO, Nightingale CE, Fletcher H, Beh T, Tanil D, Nagy A, Rubinstein A, Ponsford JL. Development and psychometric testing of a quality of recovery score after general anesthesia and surgery in adults. *Anesth Analg 1999;88-1:83-90.*
ORSDS	Opioid-related symptom distress scale **Apfelbaum JL, Gan TJ, Zhao S, Hanna DB, Chen C.** Reliability and validity of the perioperative opioid-related symptom distress scale. *Anesth Analg 2004;99-3:699-709, table of contents.*

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616 **Functional/Activity Scores/Scales**

617 Knee-specific

KOS – ADL	Knee Outcome Survey –Activities of Daily Living **Irrgang JJ, Snyder-Mackler L, Wainner RS, Fu FH, Harner CD.** Development of a patient-reported measure of function of the knee. *J Bone Joint Surg Am 1998;80-8:1132-45.*
LEAS	Lower-Extremity Activity Scale **Saleh KJ, Mulhall KJ, Bershadsky B, Ghomrawi HM, White LE, Buyea CM, Krackow KA.** Development and validation of a lower-extremity activity scale. Use for patients treated with revision total knee arthroplasty. *J Bone Joint Surg Am 2005;87-9:1985-94.*
KOOS – PS	Knee Injury and Osteoarthritis Outcome Score – Physical Function **Perruccio AV, Stefan Lohmander L, Canizares M, Tennant A, Hawker GA, Conaghan PG, Roos EM, Jordan JM, Maillefert JF, Dougados M, Davis AM.** The development of a short measure of physical function for knee OA KOOS-Physical Function Shortform (KOOS-PS) - an OARSI/OMERACT initiative. *Osteoarthritis Cartilage 2008;16-5:542-50.*

618 Not knee-specific

	Devane's Activity Score **Devane PA, Horne JG, Martin K, Coldham G, Krause B.** Three-dimensional polyethylene wear of a press-fit titanium prosthesis. Factors influencing generation of polyethylene debris. *J Arthroplasty 1997;12-3:256-66.*
PSFS	The Patient-Specific Functional Scale **Stratford PW, Gill C, Westaway M, Binkley J.** Assessing Disability and Change on Individual Patients: A Report of a Patient Specific Measure. *Physiotherapy Canada 1995;47:258–62.*
UCLA	University of California Los Angeles Activity-level Rating Also referenced as: ▪ University of California–Los Angeles activity level score ▪ University Of California Activity Index score **Amstutz HC, Thomas BJ, Jinnah R, Kim W, Grogan T, Yale C.** Treatment of primary osteoarthritis of the hip. A comparison of total joint and surface replacement arthroplasty. *J Bone Joint Surg Am 1984;66-2:228-41.*
FSI	Functional Status Index

	Jette AM. The Functional Status Index: reliability and validity of a self-report functional disability measure. *J Rheumatol Suppl 1987;14 Suppl 15:15-21.*
PASE	Physical Activity Scale for the Elderly **Washburn RA, Smith KW, Jette AM, Janney CA.** The Physical Activity Scale for the Elderly (PASE): development and evaluation. *J Clin Epidemiol 1993;46-2:153-62.*
SMFA	Short Musculoskeletal Function Assessment **Swiontkowski MF, Engelberg R, Martin DP, Agel J.** Short musculoskeletal function assessment questionnaire: validity, reliability, and responsiveness. *J Bone Joint Surg Am 1999;81-9:1245-60.*

Work-related Activity Scores

WALS	Workplace Activity Limitations Scale **Gignac MA, Badley EM, Lacaille D, Cott CC, Adam P, Anis AH.** Managing arthritis and employment: making arthritis-related work changes as a means of adaptation. *Arthritis Rheum 2004;51-6:909-16.*

Patellofemoral Scores

HSS – Patella Score	Hospital for Special Surgery – Patella Score **Baldini A, Anderson JA, Zampetti P, Pavlov H, Sculco TP.** A new patellofemoral scoring system for total knee arthroplasty. *Clin Orthop Relat Res 2006;452:150-4.*
	Feller Patella Score **Feller JA, Bartlett RJ, Lang DM.** Patellar resurfacing versus retention in total knee arthroplasty. *J Bone Joint Surg Br 1996;78-2:226-8.*
	Patellofemoral scoring System of Lonner **Lonner JH, Mehta S, Booth RE, Jr.** Ipsilateral patellofemoral arthroplasty and autogenous osteochondral femoral condylar transplantation. *J Arthroplasty 2007;22-8:1130-6.*
	Kujala Score **Kujala UM, Jaakkola LH, Koskinen SK, Taimela S, Hurme M, Nelimarkka O.** Scoring of patellofemoral disorders. *Arthroscopy 1993;9-2:159-63.*

Knee Ligament Scores/Scales

	Lysholm Knee Score **Lysholm J, Gillquist J.** Evaluation of knee ligament surgery results with special emphasis on use of a scoring scale. *Am J Sports Med 1982;10-3:150-4.*
	Tegner Activity Scale

	Tegner Y, Lysholm J. Rating systems in the evaluation of knee ligament injuries. *Clin Orthop Relat Res 1985-198:43-9.*
	Modified Cincinnati Rating System Questionnaire **Noyes FR, Barber SD, Mooar LA.** A rationale for assessing sports activity levels and limitations in knee disorders. *Clin Orthop Relat Res 1989-246:238-49.*

Pain Scores/Scales

SF – MPQ	The McGill Pain Questionnaire Short Form **Melzack R.** The short-form McGill Pain Questionnaire. *Pain 1987;30-2:191-7.*
MPQ	The McGill Pain Questionnaire – Frequency Subscale **Melzack R.** The McGill Pain Questionnaire: major properties and scoring methods. *Pain 1975;1-3:277-99.*
BPI	Brief Pain Inventory
M – BPI – sf	Brief Pain Inventory- Short Form **Cleeland CS, Ryan KM.** Pain assessment: global use of the Brief Pain Inventory. *Ann Acad Med Singapore 1994;23-2:129-38.* (As cited in Mendoza et al[1].) 1. **Mendoza T, Mayne T, Rublee D, Cleeland C.** Reliability and validity of a modified Brief Pain Inventory short form in patients with osteoarthritis. *Eur J Pain 2006;10-4:353-61.*
NRS – P	Numerical Rating scale for Pain
VAS – P	Visual Analogue Scale for Pain
PCS	Pain Catastrophizing Scale Sub score of the Coping Strategies Questionnaire (CSQ). **Rosenstiel AK, Keefe FJ.** The use of coping strategies in chronic low back pain patients: relationship to patient characteristics and current adjustment. *Pain 1983;17-1:33-44.*
PCQ – R	Pain Catastrophizing Scale – Revised Sub score of the Coping Strategies Questionnaire-Revised (CSQ-R). **Riley JL, 3rd, Robinson ME.** CSQ: five factors or fiction? *Clin J Pain 1997;13-2:156-62.*

Neuropathic Pain Scores

DN4	Neuropathic Pain Diagnostic Questionnaire **Bouhassira D, Attal N, Alchaar H, Boureau F, Brochet B, Bruxelle J, Cunin G, Fermanian J, Ginies P, Grun-Overdyking A, Jafari-Schluep H, Lanteri-Minet M, Laurent B, Mick G, Serrie A, Valade D, Vicaut E.** Comparison of pain syndromes associated with nervous or somatic lesions and development of a new neuropathic pain diagnostic questionnaire (DN4). *Pain 2005;114-1-2:29-36.*
LANSS	Leads Assessment of Neuropathic Symptoms and Signs **Bennett M.** The LANSS Pain Scale: the Leeds assessment of neuropathic symptoms and signs. *Pain 2001;92-1-2:147-57.*

Patient Satisfaction Scores/Scales

BOA	British Orthopaedic Association Patient Satisfaction Outcome **Aichroth P., Freeman M.A.R., Smillie I.S., Souter W.A.** A knee function assessment chart. From the British Orthopaedic Association Research Sub-Committee. *J Bone Joint Surg Br 1978;60-B-3:308-9.*
SAPSS	Self-administered Patient Satisfaction Scale **Mahomed N, Gandhi R, Daltroy L, Katz JN.** The self-administered patient satisfaction scale for primary hip and knee arthroplasty. *Arthritis 2011;2011:591253.*
NRS – S	Numerical Rating scale for Satisfaction
VAS – S	Visual Analogue Scale for Satisfaction
PASS	Patient Acceptable Symptom State **Tubach F, Ravaud P, Baron G, Falissard B, Logeart I, Bellamy N, Bombardier C, Felson D, Hochberg M, van der Heijde D, Dougados M.** Evaluation of clinically relevant states in patient reported outcomes in knee and hip osteoarthritis: the patient acceptable symptom state. *Ann Rheum Dis 2005;64-1:34-7.*

Wound Healing Scores

	Wound Score Form **Peerbooms JC, de Wolf GS, Colaris JW, Bruijn DJ, Verhaar JA.** No positive effect of autologous platelet gel after total knee arthroplasty. *Acta Orthop 2009;80-5:557-62.*

Fatigue Assessment Scores/Scales

MFI – 20	Multidimensional Fatigue Inventory **Smets EM, Garssen B, Bonke B, De Haes JC.** The Multidimensional Fatigue Inventory (MFI) psychometric qualities of an instrument to assess fatigue. *J Psychosom Res 1995;39-3:315-25.*
VAS – Fatigue	Visual Analogue Scale for Fatigue

Psychological Scores/Scales

Post-Traumatic Stress

IES	Impact of Event Scale **Horowitz M, Wilner N, Alvarez W.** Impact of Event Scale: a measure of subjective stress. *Psychosom Med 1979;41-3:209-18.*

Fear- avoidance Behaviour/Activity Restriction due to Fear

SAFE	Survey of Activities and Fear of Falling in the Elderly **Lachman ME, Howland J, Tennstedt S, Jette A, Assmann S, Peterson EW.** Fear of falling and activity restriction: the survey of activities and fear of falling in the elderly (SAFE). *J Gerontol B Psychol Sci Soc Sci 1998;53-1:P43-50.*
TSK	Tampa Scale for Kinesiophobia **Miller R, Kori S, Todd D.** The Tampa Scale for Kinesiophobia. 1991.

Depression and/or Anxiety/ Distress

CES – D	Center for Epidemiological Studies – Depression Scale **Radloff LS.** The CES-D scale: A self report depression scale for research in the general population. *Applied Psychological Measurement 1977;1:385–401.*
HADS	Hospital Anxiety and Depression Scale **Zigmond AS, Snaith RP.** The hospital anxiety and depression scale. *Acta Psychiatr Scand 1983;67-6:361-70.*
GDS15	Geriatric Depression Scale **D'Ath P, Katona P, Mullan E, Evans S, Katona C.** Screening, detection and management of depression in elderly primary care attenders. I: The acceptability and performance of the 15 item Geriatric Depression Scale (GDS15) and the development of short versions. *Fam Pract 1994;11-3:260-6.*
PHQ – 9	Patient Health Questionnaire-9 **Kroenke K, Spitzer RL, Williams JB.** The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med 2001;16-9:606-13.* (Module from the Patient Health Questionnaire (PHQ))[1] 1. **Spitzer RL, Kroenke K, Williams JB.** Validation and utility of a self-report version of PRIME-MD: the PHQ primary care study. Primary Care Evaluation of Mental Disorders. Patient Health Questionnaire. *JAMA 1999;282-18:1737-44.*
BDI	Beck's Depression Inventory

	Beck AT, Ward CH, Mendelson M, Mock J, Erbaugh J. An inventory for measuring depression. *Arch Gen Psychiatry 1961;4:561-71.*
SCL – 90	SCL-90 inventory **Derogatis LR, Lipman RS, Covi L.** SCL-90: an outpatient psychiatric rating scale--preliminary report. *Psychopharmacol Bull 1973;9-1:13-28.*
MADRS	Montgomery-Asperg Depression Rating Scale **Montgomery SA, Asberg M.** A new depression scale designed to be sensitive to change. *Br J Psychiatry 1979;134:382-9.*
STAI	State – Trait Anxiety Inventory Also referenced as the: ▪ State Anxiety Inventory (SAI) ▪ State-Trait Anxiety Index (As cited in Kvaal et al.[1]) 1. **Kvaal K, Ulstein I, Nordhus IH, Engedal K.** The Spielberger State-Trait Anxiety Inventory (STAI): the state scale in detecting mental disorders in geriatric patients. *Int J Geriatr Psychiatry 2005;20-7:629-34.*

Symptoms

BSI	Brief Symptom Inventory **Derogatis LR, Melisaratos N.** The Brief Symptom Inventory: an introductory report. *Psychol Med 1983;13-3:595-605.*

Perceptions

IPQ – R	Revised Illness Perception Questionnaire **Moss-Morris R, Weinman J, Petrie KJ, Horne R, Cameron LD, Buick D.** The Revised Illness Perception Questionnaire (IPQ-R). *Psychology and Health 2002;17-1:1-16.*
AHS	Arthritis Helplessness Scale **DeVellis RF, Callahan LF.** A brief measure of helplessness in rheumatic disease: the helplessness subscale of the Rheumatology Attitudes Index. *J Rheumatol 1993;20-5:866-9.*
VAS - PKN	Visual Analogue Scale, Perception of Knee Normality

Expectations

ES	Expectations Survey

	Mancuso CA, Sculco TP, Wickiewicz TL, Jones EC, Robbins L, Warren RF, Williams-Russo P. Patients' expectations of knee surgery. *J Bone Joint Surg Am 2001;83-A-7:1005-12.*

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LOT-R	Life Orientation Test–Revised **Scheier MF, Carver CS, Bridges MW.** Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): a reevaluation of the Life Orientation Test. *J Pers Soc Psychol 1994;67-6:1063-78.*

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	Self-efficacy scale for activity **Lorig K, Chastain RL, Ung E, Shoor S, Holman HR.** Development and evaluation of a scale to measure perceived self-efficacy in people with arthritis. *Arthritis Rheum 1989;32-1:37-44.*

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ABC-UK	Activities-specific Balance Confidence scale **Parry SW, Steen N, Galloway SR, Kenny RA, Bond J.** Falls and confidence related quality of life outcome measures in an older British cohort. *Postgrad Med J 2001;77-904:103-8.*

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