Making PROMs Practical for Clinical Use in Knee and Hip Osteoarthritis: Evaluating Barriers to Use and Proposing BORIS - A Possible Solution

Andrew P Savvas[a] and Matthew G Liptak BMBS[b, c]

[a] Adelaide Medical School, Adelaide, SA, Australia

[b] Orthopaedics SA, Adelaide, SA, Australia

[c] Flinders Medical Centre, Adelaide, SA, Australia

Corresponding Author: Andrew Savvas

Email: andrew.savvas@student.adelaide.edu.au

Abstract

Routine clinical use of patient reported outcome measures (PROMs) in knee and hip osteoarthritis remains highly limited despite the benefits of use. This study builds upon existing research exploring barriers to use through surveys completed by orthopaedic surgeons, general practitioner and members of the general public. Informed by these surveys and the literature, three novel and actionable strategies are proposed to guide development of more clinically practical PROMs, these are (1) reducing length (2) incorporating symptom severity stratification (3) embedding treatment and referral recommendation directly into the PROM framework. These strategies aim to align with existing clinical workflows, rather than opposing existing practices to retrofit current PROMs into the clinical environment. An exemplar PROM, named the Basic Rapid Orthopaedic Indicator Score, is provided to showcase how these strategies might be implemented.

Keywords: Osteoarthritis, Knee, Hip, PROM, Questionnaire, Pain, Function, Management

Main Text

Introduction

Monitoring the progression of knee and hip osteoarthritis (OA) is essential for effective disease management and treatment escalation. While objective measures of joint function offer practical tools for assessing disease severity, they often correlate poorly with patients' subjective experiences, which can be captured through patient-reported outcome measures (PROMs). PROMs are standardised tools for measuring patient-reported outcomes (PROs) [1], which The Food and Drug Administration defines as "any report of the status of a patient's health condition that comes directly from the patient without interpretation of the patient's response by a clinician or anyone else" [2]. In practice, PROMs typically manifest as standardised questionnaires completed by patients to capture their subjective health experience, often used to track change over time.

Numerous studies have shown weak or no correlation between various objective measures, such as the timed-up-and-go, and commonly used PROMs for knee and hip OA, including the Activities of Daily Living (ADL) and Pain subscales of the Knee injury and Osteoarthritis Outcome Score (KOOS) and Hip Disability and Osteoarthritis Outcome Score (HOOS) [3] [4]. Similarly, the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and Knee Society Score questionnaire has shown poor correlation with various objective measures [5]. Consequently, PROMs are regarded as important clinical tools amongst knee-specialist orthopaedic surgeons, with the majority of surgeons from the Australian Knee Society (AKS) explicitly agreeing that PROMs improve communication and improve the shared understanding of a patient's condition. However, despite these beliefs, actual clinical usage remains low. Only 48% of AKS members reported using PROMs at all for clinical purposes. This proportion fell to 10% amongst surveyed general practitioners

(GPs) and orthopaedic surgeons from author ML's practice, where 77% list knee or hip as a specialty area [6].

This clinical underuse is widely echoed in the orthopaedic literature. Alshehri et al. found that only 5% of studied orthopaedic surgeons used PROMs regularly for clinical work [7], whilst Choo et al. found that only 41% of studied hand surgeons collect PROMs at all, most commonly for research purposes rather than clinical [8].

Several papers have also investigated barriers to general use in orthopaedics, with commonly identified barriers including (1) uncertainty regarding PROM use or interpretation (2) time constrains and (3) logistic or administrative concerns, such as poor accessibility to PROMs in the electronic medical record and poor PROM display [8][9][10][11]. Subsequent to this, common recommendations to improve orthopaedic PROM usage have included (1) improved education surrounding PROMs utility through seminars, email communications, or continuing education incentives such as professional development points, and (2) upgrading electronic systems for easier PROM access and display [9][10][11].

Whilst these strategies would certainly be beneficial, we propose an alternative approach that aims to "swim with the current" rather than resisting current practices. Instead of implementing changes to increase use of existing PROMs, we advocate for the development of new PROMs which eliminate identified barriers. This correspondence therefore seeks to expand on reasons for clinical non-use of PROMs, with a particular focus on modifiable factors that can guide development of future clinically practical PROMs. We conclude by proposing an example of a new PROM for knee and hip osteoarthritis which is informed by these insights.

Barriers to Use and Future Development Considerations

Through anonymous surveys distributed to orthopaedic surgeons and general practitioners, we have identified various barriers to clinical usage (see Table 1), many of which align with findings in the literature.

Table 1. Reasons for Lack of PROM Usage Clinically amongst Orthopaedic Surgeons and General Practitioners

Reasons for Lack of Clinical PROM Usage	Selection Rate (%)
Surgical Respondents	
Administration/implementation issues or incompatible practice setup	39
Believe PROMs will confuse an already happy doctor-patient relationship	39
Not enough consulting time	33
Too many questions	28
Too complex	28
Patients don't understand PROMs	28
Scores are for research purposes only	22
PROMs do not help to illustrate symptoms or treatment outcomes	17
Too inefficient	11
General Practitioner Respondents	
Not enough consulting time	53
Lacking ability to administer PROMs	29
Happy with current doctor-patient relationship	22

Important considerations for future PROM development were also surveyed amongst orthopaedic surgeons, GPs and members of the general public who have experienced joint or back pain.

Table 2. Important Considerations for New PROM Development amongst Orthopaedic Surgeons, General Practitioners and the General Public.

Important Considerations for Future PROM Development	Selection Rate (%)
Surgical Respondents	
Ease of patient use	90
Time efficiency	86
Easily understandable and reliable scores	76
Easy to administer	73
Easily assess outcomes following treatment choices	67
Utility as a tool to counsel patients about their current symptoms, treatment options and possible outcomes	43
Effectively and efficiently help assess patient current symptoms	40
Efficiently help improve effective treatment choices	29
Ability to enhance doctor-patient relationships	27
Improve making all appropriate treatment choices prior to specialist referral	20
Enhance the decision to prioritise a referral to a specialist if required	20
Other	14
General Practitioner Respondents	
Time efficiency	100
Ease of patient use	84
Ease of administration	75
Easily understandable	75
Reliable Scores	75
General Public	
Ability to grade symptoms into mild, moderate and severe categories	82
Ability to suggest when a medical review would be beneficial	82
Ability to suggest when a surgical review would be beneficial	73

Notably, 91% of GPs expressed desire or potential desire for a new a simple PROM.

In light of these results and existing literature, we have identified three actionable strategies to guide future PROM development:

1. Reduce Length - Time constraints are one of the most commonly cited barriers to PROM use, both in our survey and the literature. It was the third most significant reason among surveyed surgeons and the most significant among GPs. Several other barriers, such as “too many questions,” “too complex,” “too inefficient,” or “administration/implementation issues”, can be seen as downstream effects of excessive length and complexity. A shorter, simpler PROM would reduce these burdens and make clinical implementation more feasible in the current time-constrained healthcare landscape.

   Ease of administration and patient use were also prioritised by the vast majority of surveyed clinicians, both of which may improve with reduced length. Importantly, although most existing PROMs (e.g. KOOS – 42 questions [12], HOOS – 40 questions [13], WOMAC – 24 questions [14]) involve multiple-question subscales to assess individual PROs, research has demonstrated favourable psychometric properties for single-item measures of pain and joint function in knee and hip OA specifically.

   For instance, an 11-point Numerical Rating Scale (NRS) assessing joint function showed strong correlation with the WOMAC-Function subscale and demonstrated moderate-to-large responsiveness to NSAID treatment [15]. Similarly, a Visual Analogue Scale (VAS) for pain showed modest correlation with the WOMAC Pain subscale [16]. Shortened versions of existing PROMs, such as the 12 question HOOS and short-form WOMAC, have also shown satisfactory validity, responsiveness and reliability [17][18].

   Short PROMs could be administered on paper and manually entered into the electronic medical record allowing for ease of access to PROMs and ease of recall, which was considered an important consideration by 67% of surgical respondents. This

circumvents the unideal existing electronic PROM systems which was a commonly identified barrier in the literature.

2. Incorporate Disease Severity Stratification – Stratifying PROM scores into clinically meaningful categories, such as mild, moderate, and severe, can enhance patient understanding and emphasise clinical relevance. Whitebird et al. found that many surgeons report patients struggle to interpret their scores. One surgeon noted, “patients have no idea what to compare their numbers to”, and others expressed the importance of “patient-facing” PROMs that support communication and engagement [11]. This is echoed in our surveys, with “ease of patient use” and “easily understandable” being prominent important considerations for future development. Translating abstract numerical scores into familiar, digestible terms may help to achieve these goals.

   Furthermore, 82% of respondents from the general public wanted PROMs to clearly grade symptoms into mild, moderate, and severe categories. Incorporating this feature directly addresses both patient and clinician needs for more intuitive scores.

3. Inbuilt Treatment Recommendations – Embedding treatment and referral guidance within each symptom severity category would address the major barrier identified in the literature of clinician uncertainty around PROM score interpretation. This strategy also opposes the perception that PROMs are “for research purposes only” or that they “do not help to illustrate symptoms or treatment outcomes”, held by 22% and 17% of surveyed surgeons, respectively.

   Clear treatment suggestions and referral advise could enhance the clinical utility of PROMs as decision-support tools. In our survey, 43% of surgeons identified patient

counselling on symptoms, treatment and outcomes as an important consideration, 29% highlighted treatment decision-making support, and 20% for referral guidance. Among members of the general public, 73% and 82% expressed desire for PROMs that can appropriately recommend surgical and medical review, respectively. Embedding such guidance could accelerate referrals for patients likely to benefit from surgery, while also reducing unnecessary referrals.

Analysis of predicted disease progression and treatment recommendations for each zone should be incorporated into early psychometric evaluation of new PROMs. Perhaps even further predictive factors, such as the rate of change of PROM score from presentation, could inform recommended treatment. Regardless, incorporation of treatment recommendations into the PROM itself, rather than relying on subsequent interpretation or unaffiliated research, may significantly boost clinical uptake.

Exemplar PROM

With these strategies in mind, we put forward an example PROM (see Appendix B), the Basic Orthopaedic Rapid Indicator Score (BORIS), which uses two single-scale measures to assess the PROs of joint pain and function. These individual scores are combined, placing the patient into one of three zones: mild, moderate or severe. Suggested treatment strategies for each zone are presented.

Question 1 asks: “Rate the pain you have experienced during your daily activities over the last 7 days due to the joint pain for which you are seeing the doctor today.” This is scored using a 10 centimetre VAS, from 0 (no pain) to 10 (extreme pain). A ruler can be utilised to measure the exact score.

Question 2 asks: “What degree of difficulty have you experienced during your daily activities over the last 48 hours due to the joint pain for which you are seeing the doctor today?”. This is scored on an 11-point NRS from 0 (not affected) to 10 (highly affected). Question 1 is worded similarly to the 11-point NRS found to correlate strongly with the WOMAC-Function subscale [15].

For both questions, a score of 5 (the midpoint) translates to zero points, with scores to the right translating to negative points and scores to the left translating to positive points (see Figure 1). For example, a score of 7 would yield -2 points, while a score of 2 would yield 3 points (see Figure 1). The points are then added, and the cumulative score places the patient into one of three zones. Converting the raw scores, which are always greater than 0, to total points, between -10 and +10, allows for movement from negative to positive total points with treatment, providing positive psychological feedback and further increasing intuitive interpretation. A negative score may also affirm patients’ experiences.

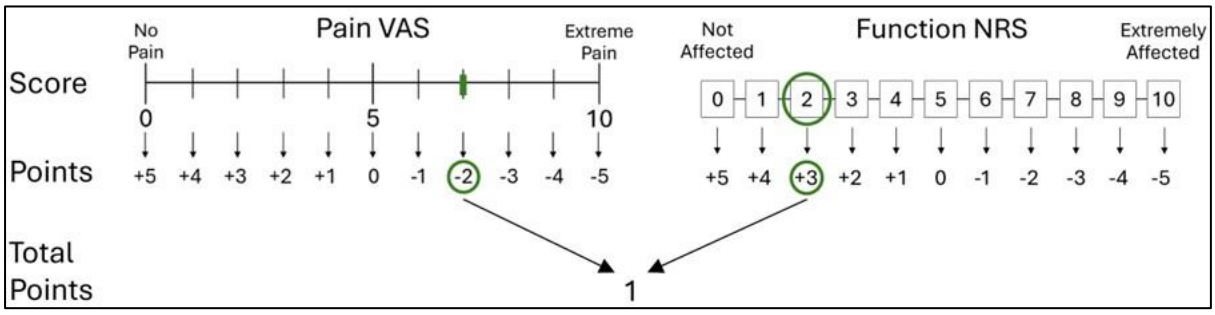

Figure 1

Zone 1 (total points > 2) indicates mild symptoms. Conservative management is the most suitable approach at this stage, which includes lifestyle modifications, low-impact exercise, over-the-counter analgesics like paracetamol or NSAIDs, and involvement from allied health professionals such as physiotherapists and exercise physiologists. Zone 2 (total points between -2 and 2) signifies moderate symptoms. Within this zone a GP consultation is

suggested, with an emphasis on advancing non-surgical management. Recommendations might include stronger analgesics, such as opioids. If management fails despite maximising non-operative strategies, a surgical referral is advised. Zone 3 (total points < −2) denotes severe symptoms. GP consultation and surgical referral are both advisable. While non-operative management may lead to some improvement in symptoms, surgical intervention may likely be required.

Despite its simplicity, BORIS remains a standardised patient-completed questionnaire designed to assess the PROs of pain and joint function. As such, it meets the essential definition of a PROM. BORIS is a PROM that may be used by general practitioners and orthopaedic surgeons, or other clinicians, to track symptom progression over time, as well as inform treatment and referral options.

BORIS and other PROMs which may be developed using these strategies are not intended to replace more multidimensional PROMs used in research and outcomes registries. Instead, they are developed in response to clinician and patient feedback, to enable faster, interpretable, and actionable PROM use in routine care. By aligning with workflow realities and embedding care direction into the scoring, BORIS represents a new class of PROMs designed for implementation-first use in musculoskeletal care.

Psychometric evaluation for BORIS or any other tool developed using these strategies is required, and this will be the focus of future research.

Conclusion

Despite widespread acknowledgment of their clinical value, PROMs remain significantly underutilized in routine care for knee and hip osteoarthritis. Our findings, in conjunction with existing literature, have revealed 3 actionable strategies for future PROM development with

the goal of increased clinical uptake. These strategies include reduced questionnaire length, incorporating symptom severity stratification and embedding treatment guidance. BORIS provides an exemplar of how these strategies may be implemented. By prioritizing implementation-first design, PROMs developed using these strategies have the potential to bridge the gap between perceived value and real-world clinical use. Future research should now focus on further developing and psychometrically evaluating such tools.

List of Abbreviations

ADL – Activities of Daily Living

AKS – Australian Knee Society

GP – General Practitioner

HOOS – Hip Disability and Osteoarthritis Outcome Score

KOOS – Knee injury and Osteoarthritis Outcome Score

NRS – Numerical Rating Scale

OA – Osteoarthritis

PRO – Patient Reported Outcome

PROM – Patient Reported Outcome Measure

VAS – Visual Analogue Scale

WOMAC – Western Ontario and McMaster Universities Osteoarthritis Index

Declarations

Ethics Approval and Consent to Participate

The surveys analysed in this manuscript were originally conducted as market research.

Consent for publication

Not Applicable

Availability of data and materials

All data analysed during this study are included in this published article and appendix.

Competing interests

AS – None

ML – Founder of MAXM, a company producing post-knee arthroplasty rehabilitation devices. ML is an orthopaedic surgeon and member of Orthopaedics SA and the Australian Knee Society.

Funding

Self-funded by authors

Authors' contributions

AS – Data interpretation, writing, review and editing

ML – Conceptualisation, data curation, supervision, review and editing

Acknowledgements

Alicia Mitchell: Writing advise.

References

1. Weldring T, Smith SM. Patient-Reported Outcomes (PROs) and Patient-Reported Outcome Measures (PROMs). Health Serv Insights. 2013;6:61-8.

2. Food and Drug Administration. Guidance for industry: Patient–reported outcome measures: Use in medical product development to support labeling claims. Rockville, MD: US Department of Health and Human Services, 2009.

3. Selzer F, Zarra MB, MacFarlane LA, Song S, McHugh CG, Bronsther C, Huizinga J, Losina E, Katz JN. Objective performance tests evaluate functional aspects overlooked by self-reported assessments in knee osteoarthritis. Osteoarthr Cartil Open. 2022;4(4):100311.

4. Dayton MR, Judd DL, Hogan CA, Stevens-Lapsley JE. Performance-Based Versus Self-Reported Outcomes Using the Hip Disability and Osteoarthritis Outcome Score Following Total Hip Arthroplasty. Aust J Phys Med Rehabil. 2016;95(2):132-8.

5. Bolink SA, Grimm B, Heyligers IC. Patient-reported outcome measures compared to inertial performance-based outcome measures: A prospective study of patients undergoing primary total knee arthroplasty. Knee. 2015;22(6):618-23.

6. Orthopaedics SA. Our Doctors [Internet]. Adelaide, SA: Orthopaedics SA, 2025. Available from: https://www.orthosa.com.au/doctors/.

7. Alshehri F, Alarabi A, Alharthi M, Alanazi T, Alohali A, Alsaleem M. Use of patient-reported outcome measures (PROMs) by orthopedic surgeons in Saudi Arabia. Journal of Orthopaedic Surgery and Research. 2020;15(1):598.

8. Choo S, Parola R, Kirby B, London DA. The Use of Patient-Reported Outcomes in Clinical Practice: A National Survey of Hand Surgeons. Journal of Hand Surgery Global Online. 2025;7(1):41-7.

9. Heath EL, Harris IA, Berkovic D, Ackerman IN. How Can the Use of Patient-Reported Outcomes Data by Orthopaedic Surgeons Be Improved? A National Qualitative Study. Clinical Orthopaedics and Related Research®. 9900:10.1097/CORR.0000000000003503.

10. Heath EL, Harris IA, Romero L, Ackerman IN. A systematic review of qualitative studies examining barriers and facilitators to orthopaedic surgeon engagement with patient-reported outcome measures data. Journal of Patient-Reported Outcomes. 2024;8(1):144.

11. Whitebird RR, Solberg LI, Ziegenfuss JY, Norton CK, Chrenka EA, Swiontkowski M, et al. What Do Orthopaedists Believe is Needed for Incorporating Patient-reported Outcome Measures into Clinical Care? A Qualitative Study. Clin Orthop Relat Res. 2022;480(4):680-7.

12. Roos EM, Roos HP, Lohmander LS, Ekdahl C, Beynnon BD. Knee Injury and Osteoarthritis Outcome Score (KOOS)—Development of a Self-Administered Outcome Measure. Journal of Orthopaedic & Sports Physical Therapy. 1998;28(2):88-96.

13. Nilsdotter AK, Lohmander LS, Klässbo M, Roos EM. Hip disability and osteoarthritis outcome score (HOOS) – validity and responsiveness in total hip replacement. BMC Musculoskeletal Disorders. 2003;4(1):10.

14. 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.

15. Ornetti P, Dougados M, Paternotte S, Logeart I, Gossec L. Validation of a numerical rating scale to assess functional impairment in hip and knee osteoarthritis: comparison with the WOMAC function scale. Ann Rheum Dis. 2011;70(5):740-6.

16. Bjerre-Bastos JJ, Li Y, Andersen JR, Christiansen C, Karsdal MA, Bihlet AR. The association between a single-question VAS pain rating and the weight-bearing and non-weight-bearing domains of WOMAC pain: a post-hoc analysis based on data from two phase 3 clinical trials. Osteoarthritis and Cartilage. 2021;29:S241-S2.

17. Gandek B, Roos EM, Franklin PD, Ware JE. A 12-item short form of the Hip disability and Osteoarthritis Outcome Score (HOOS-12): tests of reliability, validity and responsiveness. Osteoarthritis and Cartilage. 2019;27(5):754-61.

18. Yang KG, Raijmakers NJ, Verbout AJ, Dhert WJ, Saris DB. Validation of the short-form WOMAC function scale for the evaluation of osteoarthritis of the knee. J Bone Joint Surg Br. 2007;89(1):50-6.