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Patient-reported outcome score utilisation in arthroscopic hip preservation: we are all doing it differently, if at all

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ABSTRACT

Objectives To determine which outcome scores physicians are using in hip preservation surgery, as well as when they are administered, who administers them and on what platform.

Methods A cross-sectional survey was conducted to examine which patient-reported outcome (PRO) scores are being used by hip preservation surgeons, including hip joint-specific, lower extremity limb-specific, disease-specific, general health, quality of life, pain, activity, spine and psychiatric wellness scores. Descriptive statistics were calculated. Heterogeneity was assessed using I² statistics.

Results Fifty-six surgeons responded (mean 169 arthroscopic, 65 open hip preservation surgeries per year; mean 13 years experience). 13% of surgeons did not collect any patient outcome scores. A total of 25 different PROs were reported. Of 13 possible hip joint-specific outcome scores, the modified Harris Hip Score was most frequently collected (46%), followed by International Hip Outcome Tool-12 (41%) and Hip Outcome Score (38%). There was considerable heterogeneity in hip joint-specific PROs (I² 86%). The Short Form-12 was the most common general health score (30%). Tegner and UCLA Activity scores were collected by 11% of participants. Fifty-nine per cent collected outcomes preoperatively, 45% at 3 months, 54% at 6 months, 61% at 1 year and 32% annually. Paper collection was the most common collection platform (46%), and a dedicated research assistant was most frequently the source of data collection (34%).

Conclusion This international survey demonstrates that although most hip preservation surgeons collect hip outcome scores, there is a large amount of heterogeneity in outcome scores used and method of collection. As hip preservation evidence continues to evolve, these results should emphasise the need for an initiative to standardise outcome score collection.

Level of evidence Level V.

INTRODUCTION

Patient-reported outcomes (PROs) are increasingly used in today's rapidly evolving healthcare environment. A value-based approach to healthcare provided by physicians emphasises high quality and low cost. Cost may be quantified using both direct and indirect methods. The quality of care is less easily quantified. Used by patients, physicians, hospitals and payers, PROs are among one of the few quantitative methods available to assess a patient's symptomatic state and response to interventions over time. Broadly defined,

What are the new findings?

- Patient-reported outcomes are collected by the majority of hip preservation surgeons.
- There is heterogeneity in outcome scores collected by hip preservation surgeons.
- There is heterogeneity in the methods by which outcome scores are collected.
- The most common collected scores are the modified Harris Hip Score, International Hip Outcome Tool-12 and Hip Outcome Score.

outcome scores can be subjectively reported by patients or objectively reported by clinicians.¹ Further categorised, these outcomes can be joint specific (eg, Hip Outcome Score), limb specific (eg, Lower Extremity Functional Scale), disease specific (eg, Arthritis Impact Measurement Scale), activity based (eg, Tegner), general health quality of life (eg, Short Form-12 (SF-12)) or pain based (eg, Visual Analogue Scale). Data received from PROs permit clinicians to internally (or externally) follow their patients' results, observe strengths and weaknesses, make adjustments and improve the overall quality of care they provide. Recent advancements in the ability to distribute and acquire patient outcomes with improved compliance make it easier to publicly report outcomes via peer-reviewed research and conference proceedings, resulting in translation of knowledge from study findings to clinical practice. In sub-specialised areas of orthopaedic surgery, such as hip preservation where the evidence base is constantly evolving, advances in outcome score collection is critical to ensure continual improvement in care provision.

Over the past five decades, multiple PRO approaches have been developed to continue to analyse both arthritic and non-arthritic conditions in and around the hip.¹ There is currently much debate as to which PRO is 'best' for patients with non-arthritic hip diagnoses.² Clinician-based surveys of practice patterns are frequently considered 'expert opinion' level V evidence. However, in specialties like hip preservation surgery with an evidence base that is rapidly evolving and no clear gold standards, these surveys provide a highly informative glimpse into the practice patterns of those clinicians who are leading and advancing the specialty.^{3 4} The purpose of this investigation is to determine which scores physicians are using, as well as when they are administered, who administers them and on what platform. The authors

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hypothesise that this study will provide a snapshot of the disagreement among hip preservation surgeons that is already evident in the literature with regards to collecting, analysing and reporting hip outcome scores.

METHODS

Between June 2015 and August 2015, a seven-question, IRB (Institutional Review Board)-exempt, HIPAA (Health Insurance Portability and Accountability Act)-compliant, cross-sectional survey was conducted via email using SurveyMonkey (<http://www.surveymonkey.com>). The survey was emailed to hip surgeons identified via one of four methods: members of ISHA (International Society of Hip Arthroscopy), ANCHOR (Academic Network for Conservational Hip Outcome Research), MAHORN (Multicenter Arthroscopic Hip Outcomes Research Network) and a PubMed search of authors identified via a 'hip arthroscopy' algorithm. Invitations were sent to authors found within the first 200 citations not previously identified. Those identified surgeons without a contact email were excluded. There were 155 hip preservation surgeons contacted by email, 132 of whom practise in the USA and 23 of whom practise internationally. If a response was not documented within 2 weeks, subsequent email attempts were made, totalling four reminder emails. The survey was not endorsed by any regional, national or international medical, surgical or hip preservation society.

In all, the survey was composed of seven questions (online supplementary appendix). Three questions regarding the surgeon's arthroscopic and open hip preservation surgery volume and experience were posed. Questions regarding which hip outcome score questionnaires were collected from patients, as well as when they were collected, what platform was used to collect (paper hard copy or electronic) and who collected them were also posed. Likert-type questions were used where appropriate.

Results of each survey response were collected in a confidential manner and organised via the SurveyMonkey web tool. Each participant was instructed to complete every survey question. Survey participation and completion required that each participant answer every question. Descriptive statistics were calculated for each question. Continuous variable data were reported as mean $\pm$ SD. Categorical data were reported as frequencies with percentages. Heterogeneity of outcome score utilisation was assessed using I^2 ($Q-df/(Q)\times 100\%$, where Q is the χ^2 statistic. An I^2 75%–100% represented considerable heterogeneity (50%–90% substantial heterogeneity; 30%–60% moderate heterogeneity; 0%–40% less important). Statistical significance was defined as a p value less than 0.05.

RESULTS

In total, 56 responses (36% response rate) were received from surgeons spanning six countries worldwide. Thirteen per cent of survey respondents practise outside of the USA. Table 1 summarises the demographics, surgeon volume, and surgeon experience in the field of arthroscopic or open hip preservation surgery. As a group, the survey respondents performed an average of 169 ± 131 (range 0–700) arthroscopic hip procedures per year, an average of 65 ± 109 (range 0–500) open hip procedures per year and possessed 13 ± 9 (range 1–35) years of experience in the field of hip preservation surgery. Of the 56 respondents, 6 (11%) performed less than 50 arthroscopic cases per year while 36 (64%) performed less than 50 open cases per year.

Table 1 Survey respondent demographics

Surgeon experience (years), average 13 ± 9	Number of respondents
<5	13
5–9	14
10–19	14
20–29	11
>30	3
Operative volume (cases/year)	
Arthroscopic, average 169 ± 131	
0–49	6
50–100	11
100–199	18
200–299	9
300–399	9
400–499	2
>500	1
Open, average 65 ± 109	
0–49	36
50–100	4
100–199	9
200–299	3
300–399	3
400–499	0
>500	1
Country of residence	
USA	49
Canada	2
UK	2
Switzerland	1
Germany	1
Australia	1

Hip outcome scores

Table 2 summarises the percentage of survey respondents who used each hip outcome score questionnaire. Forty-nine respondents (87%) used at least one or more PROs. Forty-six respondents (82%) used two or more PROs. The average number of outcome tools collected was 3.5 (range 0–10). In all, 25 different outcome instruments were reported by those surveyed. The modified Harris Hip Score (mHHS) was the most commonly used questionnaire (46%). The iHOT (International Hip Outcome Tool)–12 (41%) was used more frequently than its longer version, the iHOT–33 (14%). Considerable heterogeneity (I^2 85.6%) was present in the outcomes used. The SF-12 was the most frequently used general health quality-of-life questionnaire used (30%). The Beck Depression Index (2%) and Low Back Outcome Score (2%) were reportedly used by only one surgeon. Both the Tegner Activity Score and UCLA Activity Score were collected by six surgeons (11%).

Outcome score collection protocols

Fifty-nine per cent of surgeons collected outcome scores preoperatively (table 3). Postoperatively, surgeons most frequently collected scores at 6 months (54%) and 1 year (61%). Following 1 year after surgery, only 32% collected annual scores indefinitely. Most outcomes were collected on paper (46%), versus electronic research databases (36%), and electronic medical records (23%). The source of data collection was most commonly a dedicated research assistant (34%) (table 3).

Table 2 Hip Outcome Score questionnaires used by survey respondents

Hip joint-specific outcome scores	N (max=56)	% response
Modified Harris Hip Score	26	46.43
iHOT-12 (International Hip Outcome Tool)	23	41.07
HOS (Hip Outcome Score)	21	37.50
NAHS (Non-Arthritic Hip Score)	10	17.86
Harris Hip Score	9	16.07
iHOT-33 (International Hip Outcome Tool)	8	14.29
WOMAC (Western Ontario and McMaster University)	7	12.50
HOOS (Hip Disability and Osteoarthritis Outcome Score)	7	12.50
Vail Hip Score	5	8.93
Oxford Hip Score	2	3.57
HAGOS (Copenhagen Hip and Groin Outcome Score)	1	1.79
FJS-12 Hip (Forgotten Joint Score)	1	1.79
AAOS Hip and Knee Outcome Score	0	0.00
Lower extremity limb-specific outcome scores		
LE CAT (Lower Extremity Computerized Adaptive Test)	1	1.79
Lower extremity function scale	0	0.00
Hamstring outcome score	0	0.00
AAOS Hip and Knee Outcome Score	0	0.00
Disease-specific outcome scores		
MACTAR (McMaster Toronto Arthritis Patient Preference Disability Questionnaire)	0	0.00
AIMS (Arthritis Impact Measurement Scale)	0	0.00
General health, quality of life, pain and psychological outcome scores		
Visual Analogue Scale	24	42.86
Short Form 12 (SF-12)*	17	30.36
Short Form 36 (SF-36)*	10	17.86
EuroQol EQ5D-5L	5	8.93
VR-12 (Veterans Rand 12-Item General Health Survey)	2	3.57
Beck Depression Index	1	1.79
EuroQol EQ5D-3L	1	1.79
Zung Depression Index	0	0.00
GROC (Global Rating of Change)	0	0.00
VR-33 (Veterans Rand 33-Item General Health Survey)	0	0.00
Activity scores		
Tegner Activity Scale	6	10.71
UCLA Activity Score	6	10.71
Marx Activity Score	2	3.57
HSAS (Hip Sports Activity Score)	1	1.79
Spine Outcome Scores		
Low back outcome score	1	1.79
Oswestry Disability Index	0	0.00
Do not collect hip outcome scores	7	12.50

*The SF-12 and SF-36 are registered trademarks of the Medical Outcomes Trust.

DISCUSSION

This international survey investigation showed that of the 56 hip preservation surgeons who responded, 49 of them collected 25 different PRO tools. Although the mHHS was the most frequently used hip joint-specific PRO, it was used by less than half (46%) of those surveyed. There was considerable

Table 3 Outcome score collection protocols

When do you collect your hip outcome scores?	N (max=56)	% response
Annually	18	32.14
New patient visit	26	46.43
Preoperatively	33	58.93
2 Weeks postoperatively	9	16.07
4 Weeks postoperatively	0	0.00
6 Weeks postoperatively	11	19.64
3 Months postoperatively	25	44.64
6 Months postoperatively	30	53.57
9 Months postoperatively	3	5.36
12 Months postoperatively	34	60.71
Other	10	17.86
How do you collect your hip outcome scores?		
Paper records	26	46.43
Electronic medical records	13	23.21
Electronic research database	20	35.71
Other	9	16.07
Who collects your hip outcome scores?		
Research assistant	19	33.93
Patient gets automated reminders and completes them on their own	17	30.36
Nurse	11	19.64
Doctor	16	28.57
Fellow/resident/student	6	10.71
Physician assistant	10	17.86
Other	14	25.00

heterogeneity in the outcome scores used (12 out of 13 available hip joint-specific questionnaires used by at least one surgeon). Fifty-nine per cent collected preoperative outcome scores and 54% and 61% collected postoperative outcomes at 6 and 12 months, respectively. Thirty-two per cent of surgeons collected long-term annual outcome scores postoperatively. Most outcome scores were collected on paper (46%) by a dedicated research assistant (34%). Such heterogeneity is reflective of the current state of hip outcome score reporting.

Universal standardisation of hip outcome score collection can allow for more consistent cross-study comparisons to be made.⁵ The ability to draw conclusions from large datasets in the literature can help predict who may perform poorly or which patients will be subject to postoperative complications.⁶ Several challenges exist in the widespread adoption of universal outcome score collection by hip preservation surgeons (table 4). To meet these challenges, several PRO tools have been developed and validated. Femoroacetabular impingement (FAI) is a relatively modern diagnosis that could see strong improvements in its surgical management via hip arthroscopy, if FAI patient outcomes are consistently measured.

Multiple systematic reviews have been performed to identify the most useful PRO for gathering data related to hip arthroscopy patients. Ramisetty *et al* used the taxonomy described by Mokkink *et al* (reliability, validity and responsiveness) to critically appraise a current list of PRO measures¹⁷ and recommended the iHOT-33 be the standardised PRO tool for the future of hip surgery. Kemp *et al* similarly suggested the iHOT-33 plus Hip Disability and Osteoarthritis Outcome Score (HOOS) be used universally.¹³ In the current study, the iHOT-33 ranked as only the sixth most popular Hip Joint Specific Outcome Score, while the HOOS ranked as tied for the seventh most popular Hip

Table 4 Challenges to outcome score collection in hip preservation surgery

Issue	Challenge	What is needed?
Which scores should be collected?	No perfect score exists—over one dozen are frequently used in arthritic and non-arthritic conditions	Scores with optimal psychometric properties—development, reliability, responsiveness, validity
When should scores be collected?	Must be frequent enough to properly monitor but not be overly burdensome to patient, induce fatigue and decrease compliance	Non-redundant, convenient and quick questionnaires so that may be given enough pre-intervention and post-intervention to increase amount of data but not so frequent that compliance drops
Who is responsible for collecting scores?	For patient-reported outcomes, clinician involvement introduces bias, takes a significant amount of time to collect, may require other staff to collect	Automated reminders that may be completed at patient's convenience so office involvement is minimal
What is the best platform for collecting scores?	Storage and analysis of paper forms are logistically suboptimal. Electronic platforms may be costly, inaccessible to select patient populations	Inexpensive, secure, user-friendly, universally accessible electronic databases integrated in the medical record

Joint Specific Outcome Score used. A 2018 systematic review by Stone *et al* found 21 different PRO tools used in the hip arthroscopy literature with an average of 3.2 PROs per article.⁶ This is a similar finding to the results of this survey which found 25 outcome tools used, with an average of 3.5 PROs per surgeon. The same systematic review concluded that based on responsiveness and psychometric properties, the iHOT tools should be employed as a widespread outcome score.⁶

The iHOT-33 was developed in 2012 by members of the MAHORN and has shown excellent reliability, validity and responsiveness.¹³ While the iHOT-33 has been useful in research settings, the number of questions can be burdensome in routine clinical settings.⁸ As a result, the iHOT-12 was established by Griffin *et al* on behalf of MAHORN.⁸ The results from the current study reflect the ease of use of the iHOT-12 as compared with iHOT-33. The authors of this paper support that the iHOT-12 should be universally used to evaluate patients both preoperatively and postoperatively.

The HOOS, HAGOS and HOS outcome tools are relatively cumbersome questionnaires (40, 37 and 28 questions, respectively) that are viewed as reliable and valid.¹ Only the HOS had significant utilisation by hip surgeons who responded in this study. One possible explanation for the shortcomings of the HOOS and HAGOS in the subset of hip preservation surgery is their questions were initially designed with an older, more sedentary population in mind,¹ perhaps lending their utility as joint arthroplasty PROs but not as hip preservation surgery PROs.

The HOS, whose validation was conducted on patients with FAI and labral pathology, consists of two subscales including activities of daily living (HOS-ADL, 19 questions) and sports (HOS-SSS, 9 questions).¹ Despite its lack of focus on patient's symptoms, it was the third most common hip joint-specific questionnaire used by the cohort of survey respondents. The mHHS, which primarily measures pain and function, was originally designated for an elderly population who may be less likely to undergo hip preservation surgery, thus explaining why the mHHS is not yet validated for hip arthroscopy and joint preservation.¹² Nonetheless, the mHHS was widely represented among this survey's respondents and was also the most commonly reported PRO in the 2018 review by Stone *et al*.⁶ One hypothesis for this popularity is the presence of a pain component in the questionnaire.⁵

General outcome measures are often viewed as secondary tools when compared with the disease-specific measures for FAI.² However, the results from the current study disagree with this trend, demonstrating that the SF-36, SF-12 and EuroQol-5D are all less commonly used as compared with the more rudimentary visual analogue pain scale (VAS). In a 2017 study on FAI outcomes, Chandrasekaran *et al* showed that the VAS can model patient satisfaction trends in four commonly used PROs (mHHS,

HOS-ADL, HOS-SSS, NAHS) with moderate correlation.⁹ In addition, the SF-36, SF-12 and EuroQol-5D require purchase through a license application and registration form, which may disincentivise their use.³ On the contrary, the Veterans Rand 12-item general health form (VR-12) and Veterans Rand 33-item general health form (VR-33) are available free of charge and hold the same validation as both SF tools.¹⁰

Activity-level measurements can provide useful information not represented in the disease-specific outcome measures.² The UCLA activity score is the most frequently used activity scoring system in studies of FAI.¹¹ The Tegner Activity Scale was developed to assess patients with an anterior cruciate ligament injury,¹² but unlike the UCLA score, the Tegner Scale provides work components stratified by physical demand and sport-specific activities. Currently, no specific measure is specifically recommended to assess the activity level of patients with FAI,³ but tools such as the hip sports activity scale (HSAS) were developed to assess hip outcomes in sports-active FAI.¹³ In the current study, 10% of surgeons used the UCLA score, 10% of surgeons used the Tegner Scale and only one surgeon used the HSAS tool.

Currently, there are no validated recommendations regarding the timing to implement PRO scores. Preoperative data can be compared with postoperative PROs with regard to function and symptoms. However, it is unknown when it is most beneficial to gather data postoperatively. Too many or too frequent questionnaires could burden the patient and cause inappropriate reporting. Only 17 surgeons in the current study collect follow-up annually, likely representing the group of hip preservation surgeons who routinely publish data. The authors hypothesise that if not for the purpose of publishing research data, the other motivating factors to collecting PROs are either to comply with quality control demands or because PROs are becoming recognised as a measure of quality by insurance payers.¹⁴

The method of data collection reported by survey respondents was most commonly on hard pages collected by research assistants. Davis *et al* reported in 2011 that more than 10% of the 83 000 physician assistants (PAs) in medical practice were working in orthopaedic surgery.¹⁵ The current study reported that 18% of the respondents used a PA for data collection while 29% of the physicians collected the data personally. Conversely, 34% of the survey respondents used a dedicated research assistant for data collection. Clinical efficiency is at risk whenever a PA or physician is required to collect data. A research assistant may be the most appropriate data-gathering representative in this situation. Less than a quarter of the survey respondents used electronic medical records (EMRs) as an aid to collect PRO data, while over one-third of respondents implemented an electronic research database (ERD), despite a recent trend towards quality measures promoting EMR. Third-party software systems such as OBERD (Outcomes Based Electronic Research Database,

Columbia, MO) and PROMIS (Patient Reported Outcome Measurement Information System, United States Department of Health and Human Services) can now be integrated into a clinical infrastructure to help streamline data collection.

The main strength of this study is its ability to gather an aggregate of clinical practice data from a cohort of international surgeons practising hip preservation surgery (mean 169 arthroscopic surgeries/year). The limitations of this study are inherent to any survey, including the possibility of selection bias and response bias. The survey was not pre-screened by a panel of experts for validity nor reliability; however, the quality of this survey and its findings can be assessed by a validated tool such as the NIH's Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies.¹⁶ The route of survey recruitment through email may pose bias as potential participants may lack this method of communication. An overall response rate of only 36% excludes data of almost two-thirds of intended participants from being analysed, thus limiting the external validity of these study findings. Responsiveness to future international surveys may be improved if study co-ordinators and/or department secretaries are contacted in addition to the surgeons. Finally, inherent to this study is the lack of contribution from countries other than the USA, specifically Mexico, Japan, South America, Greece and Chile. The paucity of responses from these locations could be attributed to language barriers since the survey was delivered in an English-only format. The degree to which language influenced is unknown, but the authors believe it may have played a role.

CONCLUSION

An international cohort of hip preservation surgeons reported a wide variety of methods for collecting hip outcome scores using an internet-based survey. As hip preservation surgery evidence continues to evolve, these results should emphasise the need for an international initiative for standardisation of outcome score collection.

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