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An Evaluation of Patient-reported Outcome Measures and Minimal Clinically Important Difference Usage in Hand Surgery

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Background: This study was designed to examine the current use of patient-reported outcome measures (PROMs) and minimal clinically important difference (MCID) calculations in the hand surgery literature in an effort to standardize their use for research purposes.

Methods: A systematic review of the hand surgery literature was conducted. All nonshoulder upper extremity articles utilizing PROMs were compared between different journals, different surgical indications, and differing usage. MCID values were reported, and calculation methods assessed.

Results: In total, 4677 articles were reviewed, and 410 met the inclusion criteria of containing at least one PROM. Of the 410 articles reporting PROMs, 148 also mentioned an associated MCID. Of the articles that mentioned MCIDs, 14 calculated MCID values based on their specific clinical populations, whereas the remainder referenced prior studies. An estimated 35 different PROMs were reported in the study period; 95 different MCID values were referenced from 65 unique articles.

Conclusions: There are many different PROMs currently being used in hand surgery clinical reports. The reported MCIDs from their related PROMs are from multiple different sources and calculated by different methods. The lack of standardization in the hand surgery literature makes interpretation of studies utilizing PROMs difficult. There is a need for a standardized method of calculating MCID values and applying these values to established PROMs for nonshoulder upper extremity conditions. *(Plast Reconstr Surg Glob Open 2023; 11:e5490; doi: 10.1097/GOX.0000000000005490; Published online 18 December 2023.)*

INTRODUCTION

Patient-reported outcome measures (PROMs) have been increasingly used in the hand surgery literature as a marker of treatment success.[1] These measures are valuable, as they focus on functional, physical, and emotional outcomes experienced by patients and not simply radiographical or surgeon-reported outcomes.[2] This "patient centered approach" seeks to identify treatment effects with meaningful benefits to patients and care that will help improve quality of life.

Despite the rapid increase in the popularity of these measures, there has been little to no standardization on the implementation of their use in hand surgery. This lack of standardization makes the interpretation of the outcomes assessed difficult to understand. Many individual PROMs have been created, but there is little evidence on how they perform in comparison with one another, and which PROM should be used in certain situations. This ambiguity has led to studies with similar methodologies, but differing use of PROMs, yielding contrasting results.[3,4] This has called into question whether the differences reported in these studies represent true differences in the populations being studied, or simply differences in the ability of the selected PROMs to adequately assess the study populations.

To provide clinically meaningful data from the milieu of PROMs, researchers have attempted to calculate the minimum improvement a patient would need to experience on a given PROM scale to be "clinically relevant." These values have been called minimal clinically

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important difference (MCID) ratios.[5] However, the calculation of these values themselves has not been standardized.[6] Reports in other musculoskeletal subspecialties have shown wide differences in reported MCIDs, both in the way these values are calculated and in the reported values themselves.[6–11] The wide variation in MCIDs, and lack of standardization, makes interpretation of PROMs nearly impossible. Standardization of PROMs and MCIDs may help compare outcomes between studies and across populations; however, standardization may be difficult, given the wide variety of conditions seen in hand and upper extremity surgery.

The purpose of the current study was to examine the use of PROMs in the hand surgery literature. The primary aim was to compare the currently reported values and calculation methods for MCID ratios. The secondary aim was to identify the overall number of PROMs, and to provide information on which measures are most common for certain surgical indications. Our hypothesis was that

Takeaways

Question: What patient-reported outcome measures (PROMs) are commonly used in hand surgery?

Findings: Multiple PROMs are used, with little standardization across studies.

Meaning: We need to develop a standardized approach to the use of PROMs to better understand their clinical applicability in hand surgery.

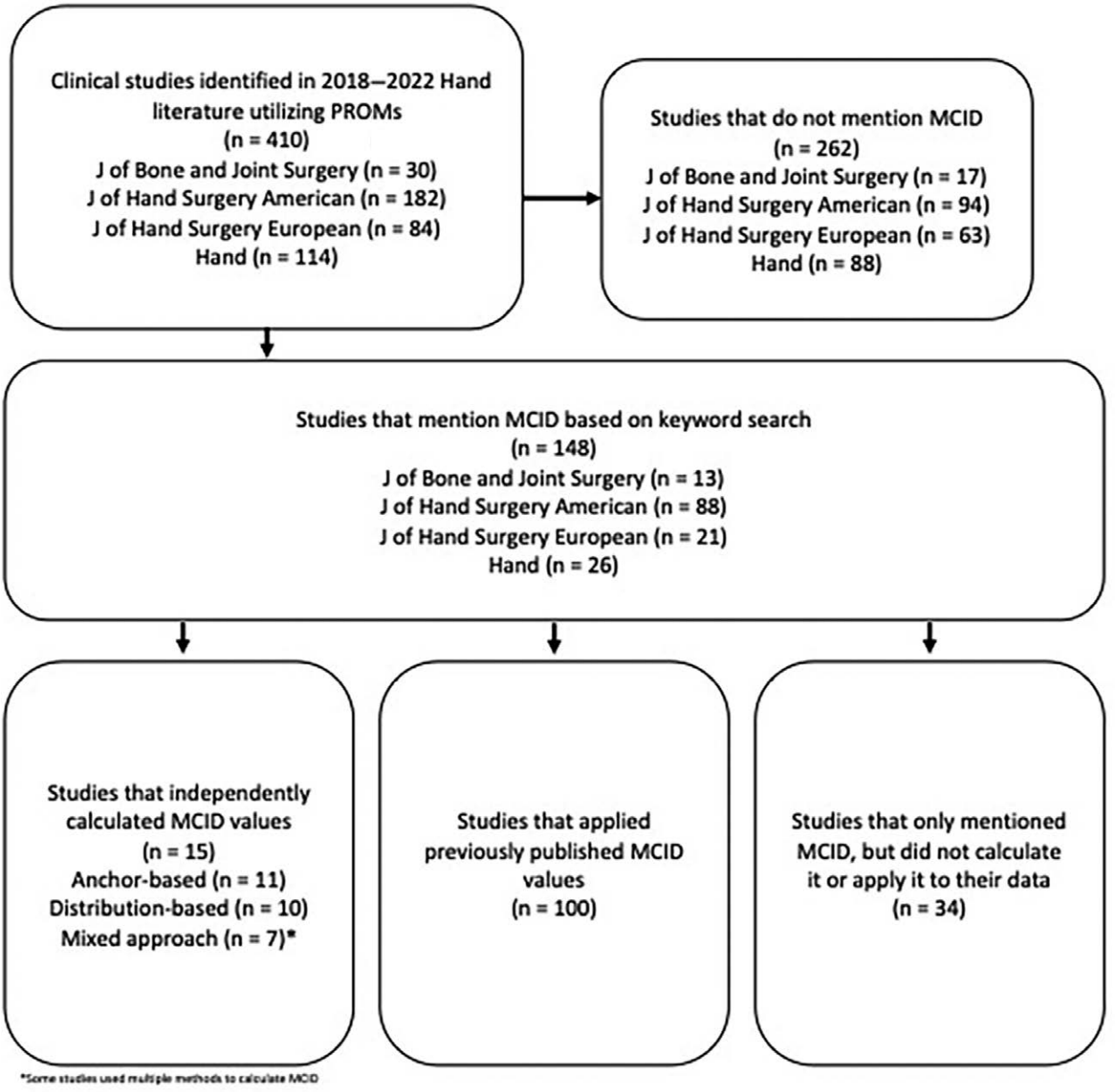

Fig. 1. A summary of articles included in the systematic review.

there would be wide variation in the reported MCID values in the hand surgery literature.

MATERIALS AND METHODS

We performed a systematic review of PROMs and MCIDs reported in the hand surgery literature between January 2018 and June 2022. to identify a representative subset of nonshoulder upper extremity surgery literature, we included PROMs published in the four orthopedic journals with the highest impact: the *Journal of Bone and Joint Surgery*, the *Journal of Hand Surgery American* (JHS Am), the *Journal of Hand Surgery European* (JHE Eu), and *Hand*. Inclusion criteria confined our search to nonshoulder upper extremity articles that reported at least one PROM as an outcome measure. We chose this methodology, as opposed to a systematic review, as we felt that utilizing search terms would not adequately identify individual PROMs and MCIDs in articles. We therefore elected for a manual screen of journals. This approach is more thorough, but less broad. A total of 4677 articles were reviewed across the four journals throughout the study period. In total, 410 of those articles met inclusion criteria. Of the included studies, 148 also reported an MCID value (Fig. 1).

PROMs Analysis

We reviewed all articles in each journal published during the study period, and included any PROM reported from any published study. If a study had multiple PROMs, all measures were included in the study. The overall number of PROMs was calculated, and the number of times an individual PROM score was used. The frequency of PROM utilization was reported in aggregate, both by journal, and by surgical indication and/or anatomical area. The subsets of surgical indication and/or anatomical area included distal radius fracture, carpal tunnel, cubital tunnel, hand fractures, forearm/elbow fractures, wrist or elbow arthroscopy, osteoarthritis, scaphoid fracture, hand/wrist pathology, elbow pathology, or other.

MCID Calculations

We also identified any study that reported an MCID reported value. Some studies referenced previously published MCID values, whereas other studies calculated their own MCID values based on their specific study population. We reported both calculated and referenced MCIDs by PROM. For example, a study may have utilized QuickDASH as the PROM. This study may have reported a referenced MCID from a prior study or calculated an MCID from the study population. If the study did both, we would have recorded both values. To ease in interpretation of the study information, we reported referenced MCID values in one table (group 1), and calculated MCID values (group 2), in separate tables. For each value, we reported the method of calculation and study population in which the calculation was conducted.

In addition to recording the MCID value of the study, we also recorded the method of the MCID calculation. MCIDs are not standardized measurements, but are calculated values from patient populations. There are three methods for calculation of an MCID: an anchor-based approach, a distribution-based approach, or a delphi approach.[12] A distribution-based approach was further categorized into one of the statistical methods: minimal detectable change, one-half SD, effect size, and standard error of the mean.

MCID values were reported in two separate groups. Group one was referenced MCID values and group two was calculated MCID values. For each value, we reported the method of calculation and study population in which the calculation was conducted.

Statistical Methods

Descriptive statistics were used to describe the findings of the PROMs and the MCIDs. Tables were utilized to present information based off frequency of PROM usage, indication of PROM usage, referenced MCID values, and calculated MCID values. PRISMA guidelines were followed in designing and conducting the study. This study was exempt from institutional review board approval due to the deidentified nature of the publicly published data we examined. No external funding was used to conduct this study.

RESULTS

In total, 410 articles were identified as reporting at least one PROM during the study period. Thirty-five unique PROMs were reported. The most commonly reported PROMs were the QuickDASH (disability of the arm, shoulder, and hand questionnaire), the visual analogue pain scale (VAS), the DASH, the patient-reported wrist evaluation (PRWE), the PROMIS measures (the NIH-sponsored patient-reported outcomes measurement information system), and the Michigan Hand Questionnaire (MHQ) (Table 1). These measures collectively account for 82% of all PROMs reported.

The most common PROM for each surgical indication and/or anatomical area was also calculated. The most utilized PROM for each indication was as follows: DASH for distal radius fractures, BCTQ (Boston Carpal Tunnel Questionnaire) for carpal tunnel, QuickDASH for cubital tunnel, VAS pain for hand fractures, MEPS (Mayo Elbow Performance Score) for forearm/elbow fractures, DASH for wrist/elbow arthroscopy, VAS pain for osteoarthritis, DASH for scaphoid fracture, VAS pain for hand/wrist pathology, DASH for elbow pathology, and QuickDASH for other. (**See table, Supplemental Digital Content 1,** which displays the PROMs by surgical indication and/or anatomical area. **http://links.lww.com/PRSGO/C952**.)[22–27,30,31,34–46,48,49,51–56,59–75]

In total, 148 studies also reported an MCID value. Of the 148 studies, 14 calculated new MCID values based off the study populations, whereas the remainder utilized referenced values. Ninety-five different MCID values were referenced from 65 unique articles. For the most common measures, there was a wide range of referenced MCID values. For the DASH measure MCID, values varied from 3.9 to 15; for QuickDASH, values varied from 6.8 to 25.8; for PRWE, values varied from 6 to 24; and for MHQ, values

Table 1. A List of All PROMs Published in 2019 Included in the Study

Patient-Reported Outcome Measure	Total
QuickDASH	131
VAS Pain	128
DASH	115
Patient-Reported Wrist Evaluation (PRWE)	63
PROMIS Pain Interference	42
PROMIS Upper Extremity	40
PROMIS Physical Function	33
Michigan Hand Questionnaire	29
PROMIS Depression	26
Boston Carpal Tunnel Questionnarie	21
Modified Mayo Wrist Score	16
EuroQol-5D	14
Mayo Wrist Score	12
PROMIS Anxiety	10
Mayo Elbow Performance Score	8
Global Physical Health	7
Likert Satisfaction Scale	7
Short Form Health Survey Form 36	6
PROMIS Pain Intensity	6
PROMIS Pain Behavior	6
PROMIS Peer Relationships	5
Canadian Occupational Performance Measure	5
Pain Intensity Numerical Rating Scale	5
PROMIS Mobility	4
Pediatric Outcomes Data Collection Instrument	4
Likert Pain Scale	4
American Shoulder and Elbow Surgeons Score	4
Unité Rhumatologique des Affections de la Main	4
Cold Intolerance Sensitivity Scale	4
Short Form Health Survey Form 12	3
Global Mental Health	3
Patient Rated Elbow Score	2
Social Well-Being Score	1
ABILHAND	1
Australian Canadian Osteoarthritis Hand Index (AUSCAN)	1

varied from 8.4 to 14.7. (**See table, Supplemental Digital Content 2,** which displays the referenced values for minimal clinically important differences. **http://links.lww.com/PRSGO/C953**.)

Similarly, there was wide variation in the studies that calculated MCID values. Calculated MCID values ranged dramatically, including QuickDASH values from 4.9 to 56.3, PRWE values from 10 to 28, and PROMIS upper extremity scores from 2 to 22 (Table 2).

In addition to the wide variation of the reported MCID values, there was also wide variation in the method used to calculate the MCID. All three MCID calculation methods were used in MCID values reported in the literature, including anchor-based methods, distribution-based methods, and the delphi approach methodology. The method of calculation for each MCID and the references were included (**see tables, Supplemental Digital Contents 1–2**, **http://links.lww.com/PRSGO/C952** and **http://links.lww.com/PRSGO/C953**). The anchor mean change was the most common method of MCID determination overall in both the previously published MCIDs and the calculated MCIDs. The one-half SD method was the most common distribution-based method for both categories.

DISCUSSION

This study found wide variation and little standardization in the use of PROMs and MCID values in the hand surgery literature. Thirty-five unique PROMs were found during the study period. Ninety-five different MCID values were referenced from 65 unique articles. Although the QuickDASH measure was the most common measure overall, other measures were found to be more popular for different surgical indications. There was no standardization across studies as to which measure was used for any specific surgical indication or anatomical area. Furthermore, there was wide variation in the reporting of MCIDs, with no standardization of calculation method for MCIDs. The most common MCIDs had large variations in reported MCID values, making interpretation and standardization of PROMs difficult.

The lack of standardization of these measures has been compounded by the recent proliferation of PROMs in the hand surgery literature. Although the use of these measures is based on good intentions and solid methodological approaches, the lack of standardization of these measures has made their use nearly impossible to meaningfully interpret. Each PROM has been created and tested independent of the other measures. However, little to no work has been done to compare the effectiveness of measures against one another, or to standardize the use of specific PROMs for specific indications.[6] Without this rigorous comparison process, surgeons are left with little to no ability to interpret the outcomes of practice changing studies in hand surgery.

The inability to interpret study results due to the lack of standardization is possibly best exemplified in the literature surrounding distal radius fractures in older patients. Large, randomized trials have shown differing results. The WRIST study group found no difference between operative and nonoperative treatment in patients over the age of 60.[3] In contrast, Martinez-Mendez found improvement with operative treatment in patients over the age of 60.[4] When examining the studies we noticed that the WRIST study group used the MHQ as the primary outcome measure, whereas the Martinez-Mendez study utilized the PRWE. Lack of standardization of these PROMs and their associated MCIDs makes it difficult to know if the varying findings of these studies represent actual differences in the studied populations or simply differences in the PROMs' ability to measure a difference if one were to exist.

Similarly, nonstandardization of MCID calculation makes interpretation of population-level data difficult. Stephens et al conducted a meta-analysis of operative versus nonoperative treatment of distal radius fractures in older patients.[14] The study found a statistically significant improvement in DASH scores at greater than 1 year for patients treated with operative management. However, the authors claimed that despite the improvement of 5.6 points on the DASH scale, the findings did not meet the

Table 2. Calculated Values for Minimal Clinically Important Differences

PROM	Citation	MCID	Method of Calculation	Population
QuickDASH	Kazmers et al[32]	10.2 10.3 10.2	Anchor mean change Anchor mean change 1/2 SD method	UE Clinic
	Kazmers et al[33]	8.8 11.7	Anchor mean change 1/2 SD method	OA
	Kazmers et al[29]	6.8	Anchor mean change	UE Clinic
	Kazmers et al[28]	10.4	1/2 SD method	CTR
	Hung et al[76]	4.93 - 56.37	Anchor mean change, anchor ROC curve, 1/2 SD, 1/3 SD, MDC90, MDC 95, MDC 99	UE Clinic
	Jorgenson et al[77]	18 10	Anchor ROC curve SEM	OA
PRWE	McCreary et al[78]	26.8 28.1 10.9	Overall health anchor mean change Mental and emotional health Anchor mean change 1/2 SD method	DRF
PROMIS UE	Kazmers et al[32]	3 4 4.1	Anchor mean change Anchor mean change 1/2 SD method	UE Clinic
	Kazmers et al[33]	4.2 4.8	Anchor mean change 1/2 SD method	OA
	Kazmers et al[29]	2.1	Anchor mean change	UE Clinic
	Kazmers et al[28]	3.6	1/2 SD method	CTR
	Bernstein et al[47]	6.3 8.0 4.2	MHQ anchor mean change BCTQ anchor mean change 1/2 SD method	CTR
	Hung et al[76]	2.60–22.16	Anchor mean change, anchor ROC curve, 1/2 SD, 1/3 SD, MDC90, MDC 95, MDC 99	UE Clinic
PROMIS PI CAT	Hollenberg et al[50]	3.7 6.8	Anchor mean change Distribution of effect sizes	DRF (anchor) UE Clinic (distribution)
	Kazmers et al[28]	3.4	1/2 SD Method	CTR
	Bernstein et al[47]	8.9 9.7 4.1	MHQ anchor mean change BCTQ anchor mean change 1/2 SD method	CTR
	Hung et al[76]	1.13–22.01	Anchor mean change, anchor ROC curve, 1/2 SD, 1/3 SD, MDC90, MDC 95, MDC 99	UE Clinic
PROMIS PF CAT	Hollenberg et al[50]	3.8 5.2	Anchor mean change Distribution of effect sizes	DRF (anchor) UE Clinic (distribution)
	Kazmers et al[32]	2.1 2.1 4.1	Anchor mean change Anchor mean change 1/2 SD method	UE Clinic
	Kazmers et al[29]	1.7	Anchor mean change	UE Clinic
	Kazmers et al[28]	4.6	1/2 SD method	CTR
	Bernstein et al[47]	1.8 2.8 2.7	MHQ anchor mean change BCTQ anchor mean change 1/2 SD method	CTR
	Sandvall et al[58]	3.6 4.6	Anchor mean change Anchor, effect sizes > 0.2 and < 0.8, with MID > MDC	DRF
	Hung et al[76]	1.61–18.83	Anchor mean change, anchor ROC curve, 1/2 SD, 1/3 SD, MDC90, MDC 95, MDC 99	UE Clinic
	Lee et al[57]	3.5 3.9	Anchor mean change Anchor, effect sizes > 0.2 and < 0.8, with MID > MDC	OA
VAS Pain	Randall et al[79]	1.9 1.6	Anchor mean change 1/2 SD method	UE Surgical

UE Clinic: Patients presenting to clinic for evaluation of upper extremity musculoskeletal conditions. OA, osteoarthritis; CTR, carpal tunnel release; DRF, distal radius fracture. UE Surgical: patients undergoing surgical treatment for upper extremity musculoskeletal conditions.

MCID that would show clinical benefit. The authors did not calculate an MCID in the study, but instead chose to reference a value of 10 that was calculated from an anchor-based method in a nondistal radius population.[15,16] This led the researchers to suggest that nonoperative management was the preferred method of treatment. However, in our study the MCID values in the literature ranged from 3 to 15, with changes based off the methodology of MCID calculation. Based on a distribution method, a commonly cited MCID for DASH would be 3.9.[13] If a value of 3 was utilized as the appropriate MCID instead of the 10 referenced by the authors, then the results of the meta-analysis would have suggested the exact opposite, that operative fixation was both statistically and clinically more beneficial than nonoperative management. So which MCID value is correct? And which calculation method is preferred?

This lack of standardization is not unique to hand surgery. Comparison studies of PROMs and methods for MCID calculation have begun in other musculoskeletal subspecialties.[6–9,17] Researchers in total joint arthroplasty have created cross-walks to convert values between different outcome measures. For example, a study by Polascik et al created a cross walk to transfer values between HOOS/KOOS and Oxford scores, two commonly reported knee and hip scores.[18] Similar work has started in hand surgery, but further work needs to be conducted to provide more specific recommendations.[19,20] The presence of cross-walks would allow for broader interpretation of clinical trial results and easier comparison in meta-analysis. In addition, more effort needs to be placed into comparing the effectiveness of different measures against one another.[6] Finally, in the lack of evidence, expert opinion may be necessary to help standardize methodological approaches in research utilizing PROMs and MCIDs. Parzizi et al have recently pioneered a novel approach to difficult methodological problems in orthopedics, utilizing an expert panel-based Delphi approach to come to clinical consensus on difficult topics.[21] A similar approach, by a governing body in hand surgery, may be helpful to standardize the process, although early attempts at doing so have not been successful.[2]

In conclusion, the use of PROMs in hand surgery has many benefits, including shifting research towards a "patient centered approach" in musculoskeletal care. However, without standardization of the use of PROMs and MCIDs, it has become very difficult to interpret studies that utilize these measures. Further research needs to be conducted to examine the comparative effectiveness of individual PROMs for specific indications, and to standardize the interpretation of MCID values. Standardizing the interpretation of MCID values will hold studies which carry implications for changes in surgical practice to a higher standard, and ultimately guide best practices for patient care.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

REFERENCES

1. Marks M. Which patient-reported outcomes shall we use in hand surgery? *J Hand Surg Eur Vol.* 2020;45:5–11.
2. Hand Surgery Quality Consortium. How should we use patient-reported outcome measures at the point of care in hand surgery? *J Hand Surg.* 2021;46:1049–1056.
3. Chung KC, Kim HM, Malay S, et al. Comparison of 24-month outcomes after treatment for distal radius fracture: the WRIST Randomized clinical trial. *JAMA Netw Open.* 2021;4:e2112710.
4. Martinez-Mendez D, Lizaur-Utrilla A, de-Juan-Herrero J. Intra-articular distal radius fractures in elderly patients: a randomized prospective study of casting versus volar plating. *J Hand Surg Eur Vol.* 2018;43:142–147.
5. Mouelhi Y, Jouve E, Castelli C, et al. How is the minimal clinically important difference established in health-related quality of life instruments? Review of anchors and methods. *Health Qual Life Outcomes.* 2020;18:136.
6. Orr MN, Klika AK, Gagnier JJ, et al. A call for a standardized approach to reporting patient-reported outcome measures: clinical relevance ratio. *J Bone Joint Surg Am.* 2021;103:e91.
7. Copay AG, Chung AS, Eyberg B, et al. Minimum clinically important difference: current trends in the orthopaedic literature, Part I: upper extremity: a systematic review. *JBJS Rev.* 2018;6:e1.
8. Copay AG, Eyberg B, Chung AS, et al. Minimum clinically important difference: current trends in the orthopaedic literature, Part II: lower extremity: a systematic review. *JBJS Rev.* 2018;6:e2.
9. Chung AS, Copay AG, Olmscheid N, et al. Minimum clinically important difference: current trends in the spine literature. *Spine.* 2017;42:1096–1105.
10. Hao Q, Devji T, Zeraatkar D, et al. Minimal important differences for improvement in shoulder condition patient-reported outcomes: a systematic review to inform a BMJ Rapid Recommendation. *BMJ Open.* 2019;9:e028777.
11. Bloom D, Kaplan D, Mojica E, et al. the minimal clinically important difference: a review of clinical significance. *Am J Sports Med.* 2023;51:520–524.
12. Samsa G, Edelman D, Rothman ML, et al. Determining clinically important differences in health status measures: a general approach with illustration to the Health Utilities Index Mark II. *PharmacoEcon.* 1999;15:141–155.
13. Beaton DE, van Eerd D, Smith P, et al. Minimal change is sensitive, less specific to recovery: a diagnostic testing approach to interpretability. *J Clin Epidemiol.* 2011;64:487–496.
14. Stephens AR, Presson AP, McFarland MM, et al. Volar locked plating versus closed reduction and casting for acute, displaced distal radial fractures in the elderly: a systematic review and meta-analysis of randomized controlled trials. *J Bone Joint Surg Am.* 2020;102:1280–1288.
15. Sorensen AA, Howard D, Tan WH, et al. Minimal clinically important differences of 3 patient-rated outcomes instruments. *J Hand Surg.* 2013;38:641–649.
16. Franchignoni F, Vercelli S, Giordano A, et al. Minimal clinically important difference of the disabilities of the arm, shoulder and hand outcome measure (DASH) and its shortened version (QuickDASH). *J Orthop Sports Phys Ther.* 2014;44:30–39.
17. SooHoo NF, Li Z, Chenok KE, et al. Responsiveness of patient reported outcome measures in total joint arthroplasty patients. *J Arthroplasty.* 2015;30:176–191.
18. Polascik BA, Hidaka C, Thompson MC, et al. Crosswalks between knee and hip arthroplasty short forms: HOOS/KOOS JR and OXford. *J Bone Joint Surg Am.* 2020;102:983–990.
19. Kim JK, Park ES. Comparative responsiveness and minimal clinically important differences for idiopathic ulnar impaction syndrome. *Clin Orthop Relat Res.* 2013;471:1406–1411.
20. Birch A, Nuttall D, Stanley JK, et al. The outcome of wrist surgery: what factors are important and how should they be reported? *J Hand Surg Eur Vol.* 2011;36:308–314.
21. Swiontkowski M, Parvizi J. ICM on VTE: a major step forward in patient care. *J Bone Joint Surg Am.* 2022;104:487–488.
22. Gummesson C, Atroshi I, Ekdahl C. The disabilities of the arm, shoulder and hand (DASH) outcome questionnaire: longitudinal construct validity and measuring self-rated health change after surgery. *BMC Musculoskelet Disord.* 2003;4:11.
23. Roy JS, MacDermid JC, Woodhouse LJ. Measuring shoulder function: a systematic review of four questionnaires. *Arthritis Rheum.* 2009;61:623–632.

24. Malay S, Study Group SUN, Chung KC. The minimal clinically important difference after simple decompression for ulnar neuropathy at the elbow. *J Hand Surg.* 2013;38:652–659.
25. Schmitt JS, Di Fabio RP. Reliable change and minimum important difference (MID) proportions facilitated group responsiveness comparisons using individual threshold criteria. *J Clin Epidemiol.* 2004;57:1008–1018.
26. Kim SJ, Ha JH, Lee CH. Minimal clinically important difference of patient-rated outcome measures in surgically treated distal radial fractures. *J Hand Surg Eur Vol.* 2020;45:197–198.
27. Beaton DE, Katz JN, Fossel AH, et al. Measuring the whole or the parts? Validity, reliability, and responsiveness of the Disabilities of the Arm, Shoulder and Hand outcome measure in different regions of the upper extremity. *J Hand Ther.* 2001;14:128–146.
28. Kazmers NH, Hung M, Bounsanga J, et al. Minimal clinically important difference after carpal tunnel release using the PROMIS platform. *J Hand Surg.* 2019;44:947–953.e1.
29. Kazmers NH, Qiu Y, Yoo M, et al. The minimal clinically important difference of the PROMIS and QuickDASH instruments in a nonshoulder hand and upper extremity patient population. *J Hand Surg.* 2020;45:399–407.e6.
30. Polson K, Reid D, McNair PJ, et al. Responsiveness, minimal importance difference and minimal detectable change scores of the shortened disability arm shoulder hand (QuickDASH) questionnaire. *Man Ther.* 2010;15:404–407.
31. Mintken PE, Glynn P, Cleland JA. Psychometric properties of the shortened Disabilities of the Arm, Shoulder, and Hand Questionnaire (QuickDASH) and numeric pain rating scale in patients with shoulder pain. *J Shoulder Elbow Surg.* 2009;18:920–926.
32. Kazmers NH, Qiu Y, Yoo M, et al. Establishing the minimal clinically important difference for the PROMIS upper extremity computer adaptive test version 20 in a nonshoulder hand and upper extremity population. *J Hand Surg.* 2021;46:927.e1–927.e10.
33. Kazmers NH, Qiu Y, Ou Z, et al. Minimal clinically important difference of the PROMIS upper-extremity computer adaptive test and QuickDASH for ligament reconstruction tendon interposition patients. *J Hand Surg.* 2021;46:516–516.e7.
34. Clement ND, Duckworth AD, Jenkins PJ, et al. Interpretation of the QuickDASH score after open carpal tunnel decompression: threshold values associated with patient satisfaction. *J Hand Surg Eur Vol.* 2016;41:624–631.
35. van der Giesen FJ, Nelissen RG, Arendzen JH, et al. Responsiveness of the Michigan Hand Outcomes Questionnaire–Dutch language version in patients with rheumatoid arthritis. *Arch Phys Med Rehabil.* 2008;89:1121–1126.
36. Costa ML, Achten J, Parsons NR, et al; DRAFFT Study Group. Percutaneous fixation with Kirschner wires versus volar locking plate fixation in adults with dorsally displaced fracture of distal radius: randomised controlled trial. *BMJ.* 2014;349:g4807.
37. Walenkamp MMJ, de Muinck Keizer RJ, Goslings JC, et al. The minimum clinically important difference of the patient-rated wrist evaluation score for patients with distal radius fractures. *Clin Orthop Relat Res.* 2015;473:3235–3241.
38. Leite JC, Jerosch-Herold C, Song F. A systematic review of the psychometric properties of the boston carpal tunnel questionnaire. *BMC Musculoskelet Disord.* 2006;7:78.
39. Ozer K, Malay S, Toker S, et al. Minimal clinically important difference of carpal tunnel release in diabetic and nondiabetic patients. *Plast Reconstr Surg.* 2013;131:1279–1285.
40. Ozyürekoğlu T, McCabe SJ, Goldsmith LJ, et al. The minimal clinically important difference of the carpal tunnel syndrome symptom severity scale. *J Hand Surg.* 2006;31:733–8; discussion 739–740.
41. Amirfeyz R, Pentlow A, Foote J, et al. Assessing the clinical significance of change scores following carpal tunnel surgery. *Int Orthop.* 2009;33:181–185.
42. Maia MV, de Moraes VY, Dos Santos JBG, et al. Minimal important difference after hand surgery: a prospective assessment for DASH, MHQ, and SF-12. *SICOT-J.* 2016;2:32.
43. London DA, Stepan JG, Calfee RP. Determining the Michigan Hand Outcomes Questionnaire minimal clinically important difference by means of three methods. *Plast Reconstr Surg.* 2014;133:616–625.
44. Hoogendam L, Koopman JE, van Kooij YE, et al; the Hand-Wrist Study Group. What are the minimally important changes of four commonly used patient-reported outcome measures for 36 hand and wrist condition-treatment combinations? *Clin Orthop Relat Res.* 2022;480:1152–1166.
45. Siviero P, Limongi F, Gesmundo A, et al; EPOSA Research Group. Minimal clinically important decline in physical function over one year: EPOSA study. *BMC Musculoskelet Disord.* 2019;20:227.
46. Bellamy N, Hochberg M, Tubach F, et al. Development of multinational definitions of minimal clinically important improvement and patient acceptable symptomatic state in osteoarthritis. *Arthritis Care Res.* 2015;67:972–980.
47. Bernstein DN, Houck JR, Mahmood B, et al. Minimal clinically important differences for PROMIS physical function, upper extremity, and pain interference in carpal tunnel release using region- and condition-specific PROM tools. *J Hand Surgery* 2019;44:635–640.
48. Morgan EM, Mara CA, Huang B, et al. Establishing clinical meaning and defining important differences for patient-reported outcomes measurement information system (PROMIS) measures in juvenile idiopathic arthritis using standard setting with patients, parents, and providers. *Qual Life Res.* 2017;26:565–586.
49. Wilkinson JT, Clawson JW, Allen CM, et al. Reliability of telephone acquisition of the PROMIS upper extremity computer adaptive test. *J Hand Surg* 2021;46:187–199.
50. Hollenberg AM, Hammert WC. Minimal clinically important difference for PROMIS physical function and pain interference in patients following surgical treatment of distal radius fracture. *J Hand Surg.* 2022;47:137–144.
51. Ho B, Houck JR, Flemister AS, et al. Preoperative PROMIS scores predict postoperative success in foot and ankle patients. *Foot Ankle Int.* 2016;37:911–918.
52. Yost KJ, Eton DT, Garcia SF, et al. Minimally important differences were estimated for six patient-reported outcomes measurement information system-cancer scales in advanced-stage cancer patients. *J Clin Epidemiol.* 2011;64:507–516.
53. Amtmann D, Kim J, Chung H, et al. Minimally important differences for patient reported outcomes measurement information system pain interference for individuals with back pain. *J Pain Res.* 2016;9:251–255.
54. Lee AC, Driban JB, Price LL, et al. Responsiveness and minimally important differences for 4 patient-reported outcomes measurement information system short forms: physical function, pain interference, depression, and anxiety in knee osteoarthritis. *J Pain.* 2017;18:1096–1110.
55. Chen CX, Kroenke K, Stump TE, et al. Estimating minimally important differences for the PROMIS pain interference scales: results from 3 randomized clinical trials. *Pain.* 2018;159:775–782.
56. Steinhaus ME, Iyer S, Lovecchio F, et al. Minimal clinically important difference and substantial clinical benefit using PROMIS CAT in cervical spine surgery. *Clin Spine Surg.* 2019;32:392–397.
57. Lee DJ, Calfee RP. The minimal clinically important difference for PROMIS physical function in patients with thumb carpometacarpal arthritis. *Hand (New York, N.Y.).* 2021;16:638–643.

58. Sandvall B, Okoroafor UC, Gerull W, et al. Minimal clinically important difference for promis physical function in patients with distal radius fractures. *J of Hand Surg.* 2019;44:454–459.e1.
59. Swanholm E, McDonald W, Makris U, et al. Estimates of minimally important differences (MIDs) for two patient-reported outcomes measurement information system (PROMIS) computer-adaptive tests in chronic pain patients. *J Appl Biobehav Res.* 2014;19:217–232.
60. Thissen D, Liu Y, Magnus B, et al. Estimating minimally important difference (MID) in PROMIS pediatric measures using the scale-judgment method. *Qual Life Res.* 2016;25:13–23.
61. Norman GR, Sloan JA, Wyrwich KW. Interpretation of changes in health-related quality of life: the remarkable universality of half a standard deviation. *Med Care.* 2003;41:582–592.
62. Myles PS, Myles DB, Galagher W, et al. Measuring acute postoperative pain using the visual analog scale: the minimal clinically important difference and patient acceptable symptom state. *Br J Anaesth.* 2017;118:424–429.
63. Tashjian RZ, Deloach J, Porucznik CA, et al. Minimal clinically important differences (MCID) and patient acceptable symptomatic state (PASS) for visual analog scales (VAS) measuring pain in patients treated for rotator cuff disease. *J Shoulder Elbow Surg.* 2009;18:927–932.
64. Kelly A. The minimum clinically significant difference in visual analogue scale pain score does not differ with severity of pain. *Emerg Med J.* 2001;18:205–207.
65. Farrar JT, Portenoy RK, Berlin JA, et al. Defining the clinically important difference in pain outcome measures. *Pain.* 2000;88:287–294.
66. Farrar JT, Young JP, LaMoreaux L, et al. Clinical importance of changes in chronic pain intensity measured on an 11-point numerical pain rating scale. *Pain.* 2001;94:149–158.
67. Walters SJ, Brazier JE. Comparison of the minimally important difference for two health state utility measures: EQ-5D and SF-6D. *Qual Life Res.* 2005;14:1523–1532.
68. Marti C, Hensler S, Herren DB, et al. Measurement properties of the EuroQoL EQ-5D-5L to assess quality of life in patients undergoing carpal tunnel release. *J Hand Surg Eur Vol.* 2016;41:957–962.
69. Berliner JL, Brodke DJ, Chan V, et al. John Charnley award: preoperative patient-reported outcome measures predict clinically meaningful improvement in function after THA. *Clin Orthop Relat Res.* 2016;474:321–329.
70. Cleland JA, Fritz JM, Whitman JM, et al. The reliability and construct validity of the Neck Disability Index and patient specific functional scale in patients with cervical radiculopathy. *Spine.* 2006;31:598–602.
71. Chatman AB, Hyams SP, Neel JM, et al. The patient-specific functional scale: measurement properties in patients with knee dysfunction. *Phys Ther.* 1997;77:820–829.
72. Maughan EF, Lewis JS. Outcome measures in chronic low back pain. *Eur Spine J.* 2010;19:1484–1494.
73. Law M, Baptiste S, McColl M, et al. The Canadian occupational performance measure: an outcome measure for occupational therapy. *Can J Occup Ther.* 1990;57:82–87.
74. Oeffinger D, Bagley A, Rogers S, et al. Outcome tools used for ambulatory children with cerebral palsy: responsiveness and minimum clinically important differences. *Dev Med Child Neurol.* 2008;50:918–925.
75. Hsu HY, Su FC, Kuo YL, et al. Assessment from functional perspectives: using sensorimotor control in the hand as an outcome indicator in the surgical treatment of carpal tunnel syndrome. *PLoS One.* 2015;10:e0128420.
76. Hung M, Tyser A, Saltzman CL, et al. Establishing the minimal clinically important difference for the PROMIS and qDASH: level 1 evidence. *J Hand Surg.* 2018;43:S22.
77. Jørgensen RW, Nyring MRK. The minimal important change for the QuickDASH in patients with thumb carpometacarpal arthritis. *J Hand Surg Eur Vol.* 2021;46:975–978.
78. McCreary DL, Sandberg BC, Bohn DC, et al. Interpreting patient-reported outcome results: is one minimum clinically important difference really enough? *Hand (New York, N.Y.).* 2020;15:360–364.
79. Randall DJ, Zhang Y, Li H, et al. Establishing the minimal clinically important difference and substantial clinical benefit for the pain visual analog scale in a postoperative hand surgery population. *Journal Hand Surg.* 2022;47:645–653.